

Research and Development in Industry: 1992

Funds, 1992
Scientists & Engineers,
January 1993

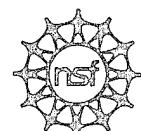
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Contributors

Data collection, preparation, and tabulations were performed by the Bureau of the Census, Department of Commerce, for the National Science Foundation. The Project Officer for this report was Raymond M. Wolfe.

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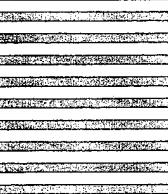
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GENERAL NOTES

This report provides statistics on research and development (R&D) funding for the years 1982-92 and on R&D personnel for the period from January 1983 to January 1994. The statistics are produced from results of the annual Survey of Industrial Research and Development and provide national estimates of the total expenditures on R&D performed within the United States by industrial firms, whether U.S. or foreign owned. It is a sample survey that intends to include or represent all R&D-performing companies, either publicly or privately held. Every year a survey questionnaire is sent to all companies known, through previous surveys or through outside information sources, to spend more than \$1 million annually on R&D in the United States or to have 1,000 or more employees. Remaining firms are subjected to probability sampling and may or may not receive a questionnaire for a given survey year.

Industry statistics are developed from data collected from individual companies or enterprises. Since the survey is enterprise based rather than establishment based, all data collected for the various subparts of each enterprise (plants, divisions, or subdivisions) are tabulated in the major standard industrial classification (SIC) of the company. The resulting industry estimates are reported using the SIC of the companies within each industry. National totals are estimated by summing the industry estimates.

Several changes have been made to the survey recently that are of special importance to users of this report. Prior to the 1992 survey, statistics were based on samples selected at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987). In intervening years a subset of the last sample (called a "panel") was used. The most recent sample prior to the 1992 survey was for survey year 1987. Estimates for 1988 through 1991 published in previous reports were based on surveys of approximately 1,700 panel companies that reported R&D activity in the 1987 survey. Beginning with the 1992 survey, statistics are based on samples selected annually. Also, beginning with the 1992 survey, the sample size was increased from approximately 14,000 to nearly 23,400 firms to better account for births of R&D-performing establishments in the

survey universe, to survey more fully and accurately R&D performed by nonmanufacturing firms especially in the service sector and small firms in all industries, and to gather more current information about potential R&D performers. In this report, tables containing historical statistics are presented two ways. For the tables in section A, estimates from the 1992 survey are linked with estimates from the 1987 survey. The linking was accomplished using an algorithm that preserved to the greatest extent possible year-to-year trends for each industry. A full explanation of the linking process is included in section B, under "Comparability of Statistics." Also in section B is a series of tables for which no attempt was made to link the estimates derived from data collected in the 1992 survey to estimates derived from data collected in previous surveys.

The Bureau of the Census, Department of Commerce, has conducted the annual Survey of Industrial Research and Development for the National Science Foundation (NSF) since 1957. Census staff conduct the survey under Title 13 of the United States Code, which prohibits publication or release of data or statistics that may reveal information about individual companies. Therefore, in some tables of this report the symbol "(D)" is used as a footnote reference to indicate that estimates are being withheld to avoid possible disclosure of information about operations of individual companies.

The tables containing statistics developed from the survey data are in section A. Detailed information about the history of the survey, survey methodology, comparability of the statistics, and survey definitions are in the technical notes in section B, and survey questionnaires, instructions, and other survey documents are reproduced in section C. Specific questions regarding the survey may be directed to Raymond Wolfe at (703) 306-1772, via e-mail at rwlfe@nsf.gov (Internet), or at the following mailing address:

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Notes

To obtain accurate historical statistics, use only the latest detailed statistical tables in this report and not those published earlier. Statistics in trend tables are derived from the most recently completed survey cycle. Data for prior years are reviewed for consistency with current-year responses and are revised when necessary. Consequently, this report contains the latest revised statistics from the Survey of Industrial Research and Development.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes in section B for more information.

SECTION A. DETAILED STATISTICAL TABLES

TABLE NOTES

Classification of reporting units

The basic reporting unit is the company or enterprise that includes all establishments under common ownership or control. All research and development (R&D) expenditures and all scientists and engineers of each company are classified into a single standard industrial classification (SIC) and size category.

Company Size-Class

Companies are categorized by their total number of domestic employees. The following are the six company size-classes used in this report:

1. Fewer than 500 employees;
2. 500 to 999 employees;
3. 1,000 to 4,999 employees;
4. 5,000 to 9,999 employees;
5. 10,000 to 24,999 employees;
6. 25,000 or more employees.

Current and Constant Dollars

Statistics in all tables are reported in terms of current dollars. Constant dollars are also presented in two summary trend tables, tables A-1 and A-22.

Geographic Statistics

The statistics cover only those operations located in the 50 States and the District of Columbia. Company-sponsored R&D performed outside the United States by foreign subsidiaries of U.S. domestic companies is included in table A-9 but is excluded from all other tables.

Industry Classification

An enterprise or company level SIC code was assigned to each company. A single SIC code was assigned to multiestablishment companies based on the code that represented the most dominant aggregated activity for that firm in terms of total payroll. Statistics for the following industry groupings are published in this report (SIC code(s) are shown in parentheses¹):

Food, kindred, and tobacco products (20,21) ²
Textiles and apparel (22,23)
Lumber, wood products, and furniture (24,25)
Paper and allied products (26)
Chemicals and allied products (28)
Industrial chemicals (281-82,286)
Drugs and medicines (283)
Other chemicals (284-85,287-89)
Petroleum refining and extraction (13,29)
Rubber products (30)
Stone, clay, and glass products (32)
Primary metals (33)
Ferrous metals and products (331-32,3398-99)
Nonferrous metals and products (333-36)
Fabricated metal products (34)
Machinery (35)
Office, computing, and accounting machines (357)
Other machinery, except electrical (351-56,358-59)
Electrical equipment (36)
Radio and TV receiving equipment (365)
Communication equipment (366)
Electronic components (367)
Other electrical equipment (361-64,369)
Transportation equipment (37)
Motor vehicles and motor vehicles equipment (371)
Other transportation equipment (373-75,379)
Aircraft and missiles (372,376) ³
Professional and scientific instruments (38)
Scientific and mechanical measuring instruments (381-82)
Optical, surgical, photographic, and other instruments (384-87)
Other manufacturing industries—printing and publishing (27), leather products (31), and miscellaneous manufacturing industries (39)

² Until 1984, the tobacco products industry (SIC 21) was included with "other manufacturing industries."

³ Because of the close similarity of their R&D activities, companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts.

¹ When the 1992 sample was drawn, the 1987 revision of the standard industrial classification (SIC) system was in effect.

Nonmanufacturing industries—agricultural services, forestry, fishing and hunting (07-09); mining (10, 12-14); construction (15-17); transportation, communications, electric, gas, and sanitary services (40-42,44-49); wholesale and retail trade (50-59); finance, insurance, and real estate (60-65); holding and other investment offices (67); hotels and motels (701); business services (73); automotive repair, services, and parking and miscellaneous repair services (75-76); motion pictures and amusement and recreation services (78-79); health and legal services (80-81); social services (83); museums, art galleries, botanical and zoological gardens (84); engineering, accounting, research, management, and related services (87); and miscellaneous services (89).

Percentages

Percentages were calculated on the basis of thousands of dollars and may differ from those calculated using the rounded figures shown.

Rounding

Because of rounding, detail may not add to totals.

Suppression of Statistics

The Bureau of the Census conducts the survey under Title 13 of the United States Code, which prohibits

publication or release of data or statistics that may reveal information about individual companies. Also, missing data are imputed for some data items. Therefore, the data in some of the table cells may have been deleted and replaced with one of the following notations:

“(D),” which indicates that statistics are being withheld to avoid possible disclosure of information about operations of individual companies. This occurs when a small number of companies account for a large percentage of the R&D funds or of scientists and engineers in a particular data cell. The tables most often affected by this rule are those that contain data on Federal support to companies for R&D performance.

“(S),” which indicates that the imputation rate—the percentage of the statistic not reported by respondents and consequently estimated—exceeds 50 percent for that item. See table B-3 in section B for imputation rates for specific items.

Although publication of certain cells may be withheld, the estimates in the cells are always included in totals. In some instances, cells withheld because of high imputation rates (notation “(S)”) can be derived by subtraction from higher level totals. In such cases the user should be aware that the derived numbers are statistically unreliable. In no instance can cells be derived that would disclose operations of individual companies (notation “(D)”).

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This is a comprehensive list of all tables in this publication. The list includes the detailed statistical tables in section A and the technical tables in section B.

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1953-92 and estimates for 1993-94**

[Dollars in millions]

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Year	Total R&D		Federal		Company 1/	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
1953.....	\$3,630	16,500	\$1,430	6,500	\$2,200	10,000
1954.....	4,070	18,333	1,750	7,883	2,320	10,450
1955.....	4,640	20,262	2,180	9,520	2,460	10,742
1956.....	6,605	27,987	3,328	14,102	3,277	13,886
1957.....	7,731	31,684	4,335	17,766	3,396	13,918
1958.....	8,389	33,691	4,759	19,112	3,630	14,578
1959.....	9,618	37,570	5,635	22,012	3,983	15,559
1960.....	10,509	40,419	6,081	23,388	4,428	17,031
1961.....	10,908	41,475	6,240	23,726	4,668	17,749
1962.....	11,464	42,617	6,434	23,918	5,029	18,695
1963.....	12,630	46,434	7,270	26,728	5,360	19,706
1964.....	13,512	48,780	7,720	27,870	5,792	20,910
1965.....	14,185	49,947	7,740	27,254	6,445	22,694
1966.....	15,548	52,884	8,332	28,340	7,216	24,544
1967.....	16,385	54,076	8,365	27,607	8,020	26,469
1968.....	17,429	54,808	8,560	26,918	8,869	27,890
1969.....	18,308	54,814	8,451	25,302	9,857	29,512
1970.....	18,067	51,327	7,779	22,099	10,288	29,227
1971.....	18,320	49,380	7,666	20,663	10,654	28,717
1972.....	19,552	50,392	8,017	20,662	11,535	29,729
1973.....	21,249	51,450	8,145	19,722	13,104	31,729
1974.....	22,887	50,973	8,220	18,307	14,667	32,666
1975.....	24,187	49,161	8,605	17,490	15,582	31,671
1976.....	26,997	51,620	9,561	18,281	17,436	33,338
1977.....	29,825	53,354	10,485	18,757	19,340	34,597
1978.....	33,304	55,231	11,189	18,556	22,115	36,675
1979.....	38,226	58,271	12,518	19,082	25,708	39,189
1980.....	44,505	62,071	14,029	19,566	30,476	42,505
1981.....	51,810	65,665	16,382	20,763	35,428	44,902
1982.....	58,650	69,988	18,545	22,130	40,105	47,858
1983.....	65,268	74,849	20,680	23,716	44,588	51,133
1984.....	74,800	82,198	23,396	25,710	51,404	56,488
1985.....	84,239	89,236	27,196	28,809	57,043	60,427
1986.....	87,823	90,633	27,891	28,783	59,932	61,849
1987.....	92,155	92,155	30,752	30,752	61,403	61,403
1988.....	97,015	93,373	30,343	29,204	66,672	64,169
1989.....	102,055	94,060	28,554	26,317	73,501	67,743
1990.....	109,727	96,846	28,125	24,823	81,602	72,023
1991.....	116,952	99,449	26,372	22,425	90,580	77,024
1992.....	121,314	100,342	24,660	20,397	96,654	79,945
1993 (NSF estimate).....	122,000	98,785	24,000	19,433	98,000	79,352
1994 (NSF estimate)	123,800	98,176	24,000	19,033	99,800	79,144

1/ Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

N/A Not available

NOTE: 1987 gross domestic product implicit price deflators were used to convert current dollars to constant dollars. As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-2. Selected data for R&D-performing companies, by industry: 1991-92

Industry 1/ SIC code		Research and development funds						Domestic net sales				R&D scientists & engineers				Domestic employment [in thousands]	
		Total		Federal		Company		January 2/ 1993		January 2/ 1992		1991		March 1991			
		1991	1992	1991	1992	1991	1992	1991	1992	1991	1992	1991	1992	1991	1992		
Total.....		\$116,952	\$121,314	\$26,372	\$24,660	\$90,580	\$96,654	\$2,939,040	\$3,063,469	779,3	787,1	16,963	16,632				
Food and kindred products.....	20	1,244	1,371	0	0	1,244	1,371	249,411	258,484	9,6	9,6	1,007	1,008				
Tobacco products.....	21	33	40	(D)	(D)	33	40	4,922	(S)	0,2	0,2	16	15				
Textile mill products.....	22	(D)	(D)	(D)	(D)	180	190	31,189	34,378	2,1	2,2	325	328				
Apparel.....	23	(D)	(D)	(D)	(D)	56	69	7,852	8,688	0,8	0,9	83	83				
Lumber and wood products, except furniture.....	24	40	(D)	0	0	40	(D)	5,915	6,839	0,3	0,3	53	60				
Furniture and fixtures.....	25	(D)	(D)	(D)	(D)	160	168	16,976	18,035	1,2	1,4	211	213				
Paper and allied products.....	26	(D)	(D)	(D)	(D)	1,174	1,191	110,152	114,369	10,7	10,7	577	571				
Printing, publishing, and allied industries.....	27	(D)	(D)	(D)	(D)	67	(D)	31,478	27,862	2,5	2,5	277	271				
Chemicals and allied products.....	28	14,648	16,711	209	11	14,439	16,420	271,027	279,595	85,6	89,2	1,203	1,150				
Petroleum refining and extraction.....	13,29	2,498	2,339	11	9	2,487	2,330	241,341	237,516	11,5	11,5	441	406				
Rubber products.....	30	(D)	(D)	(D)	(D)	(D)	(D)	1,337	49,739	52,926	14,8	14,9	388	393			
Leather and leather products.....	31	(D)	(D)	(D)	(D)	0	0	2,986	3,562	0,2	0,2	29	32				
Stone, clay, and glass products.....	32	(D)	(D)	(D)	(D)	455	479	27,741	28,815	5,3	5,3	234	232				
Primary metals.....	33	714	555	8	8	706	542	87,303	88,877	5,1	4,9	451	447				
Fabricated metal products.....	34	974	1,057	226	293	748	764	63,205	68,185	8,7	8,2	486	500				
Machinery.....	35	14,775	15,135	1,055	1,062	13,720	14,073	182,426	193,697	99,3	99,4	1,417	1,347				
Electrical equipment.....	36	13,456	13,546	4,550	3,857	8,865	9,689	207,759	236,605	91,9	90,5	1,393	1,382				
Transportation.....	37	27,428	26,484	12,570	10,738	14,858	15,726	370,104	380,434	141,1	144,7	895	879				
Professional and scientific instruments.....	38	8,705	9,652	1,865	2,226	6,840	7,426	95,962	102,522	(S)	(S)	106	108				
Miscellaneous manufacturing industries.....	39	(D)	(D)	(D)	(D)	(D)	(D)	322	28,367	29,565	3,4	3,2					
Communication services.....	48,part 737	(D)	(D)	(D)	(D)	4,206	4,131	181,979	188,215	34,0	33,1	1,040	1,002				
Electric, gas, and sanitary services.....	49	(D)	(D)	(D)	(D)	262	309	168,297	172,088	1,7	1,9	567	556				
Computer programming, data processing, other computer-related engineering, architectural and surveying services.....	part 737,871	5,769	6,663	2,528	2,774	3,241	3,889	46,042	48,996	52,9	60,0	395	367				
Hospitals and medical and dental laboratories.....	806-07	549	615	145	191	404	424	15,604	17,591	4,4	4,6	283	294				
Research, development, and and testing services.....	873	9,302	9,667	1,313	1,381	7,989	8,286	12,927	14,068	52,4	54,6	170	164				
Other nonmanufacturing industries.....	07-10, 12-17, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	40-42, 44-49,	7,098	259	257	6,839	7,172	428,336	446,619	57,1	56,9	2,920	2,922				

1/ Industries, industry groups, and product fields shown separately are classified according to the 1987 Standard Industrial Classification (SIC) manual codes.

2/ Data recorded in January represent employment figures for the previous year.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	[Dollars in millions]							Page 1 of 2		
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total.....	\$58,650	\$65,268	\$74,800	\$84,239	\$87,823	\$92,155	\$97,015	\$102,055	\$109,727	\$116,952	\$121,314
Distribution by industry:											
Food, kindred, and tobacco products 1/.....	20,21	(D)	(D)	(D)	(D)	(D)	1,206	(D)	(D)	1,277	1,411
Textiles and apparel.....	22,23	(D)	(D)	(D)	(D)	(D)	137	(D)	(D)	(D)	277
Lumber, wood products, and furniture.....	24,25	159	152	143	147	144	(D)	(D)	(D)	(D)	(D)
Paper and allied products.....	26	566	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products.....	28	6,604	7,185	7,927	8,540	8,843	9,635	11,067	12,069	13,291	14,648
Industrial chemicals.....	281-82,286	3,206	3,214	3,240	3,498	3,552	3,716	4,172	4,451	5,010	5,390
Drugs and medicines.....	283	(D)	(D)	(D)	(D)	(D)	3,658	(D)	(D)	(D)	5,406
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	(D)	(D)	1,633	(D)	(D)	(D)	8,831
Petroleum refining and extraction.....	13,29	(D)	(D)	(D)	(D)	(D)	1,897	1,997	2,180	2,306	2,498
Rubber products.....	30	(D)	(D)	(D)	(D)	(D)	950	995	(D)	(D)	(D)
Stone, clay, and glass products.....	32	(D)	(D)	(D)	(D)	(D)	730	637	686	739	714
Primary metals.....	33	987	1,085	(D)	(D)	(D)	(D)	(D)	(D)	(D)	555
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	(D)	(D)	(D)	(D)	(D)	416	458	(D)	(D)	(D)
Fabricated metal products.....	34	625	701	842	829	895	783	881	904	939	974
Machinery.....	35	8,078	9,027	10,504	12,216	(D)	(D)	(D)	(D)	14,446	14,775
Office, computing, and accounting machines.....	351-56,358-59	357	(D)	(D)	(D)	(D)	2,396	2,428	(D)	(D)	(D)
Other machinery, except electrical.....	36	10,923	12,681	13,778	14,432	14,980	15,848	14,128	13,318	13,400	13,415
Electrical equipment.....	365	(D)	(D)	(D)	(D)	(D)	133	139	(D)	(D)	(D)
Radio and TV receiving equipment.....	366	5,839	7,298	8,685	9,397	9,669	10,184	8,427	7,071	5,928	4,787
Communication equipment.....	367	1,740	2,169	2,831	3,385	(D)	4,286	(D)	(D)	(D)	(D)
Electronic components.....	361-64,369	(D)	(D)	(D)	(D)	(D)	1,239	(D)	(D)	(D)	3,678
Other electrical equipment.....	37	(D)	(D)	(D)	(D)	31,275	34,246	34,775	33,859	31,361	27,428
Transportation equipment.....	371	4,797	5,318	6,057	6,984	(D)	(D)	(D)	(D)	(D)	26,484
Motor vehicles and motor vehicles equipment.....	373-75,379	(D)	(D)	(D)	(D)	22,231	21,050	24,458	24,168	22,331	20,635
Aircraft and missiles.....	372,376	14,451	15,406	18,858							16,629

See explanatory information and SOURCE at end of table.

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company		SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Page 2 of 2
Distribution by industry:														
Professional and scientific instruments.....	38	\$3,930	\$4,266	\$4,602	\$5,013	\$5,103	\$5,222	\$5,530	\$5,992	\$7,055	\$8,705	\$9,652		
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	5,256	
Optical, surgical, photographic, and other instruments.....	384-87	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	4,396	
Other manufacturing industries 1/.....	27,31,39	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	2,472	3,337	4,905	6,714	7,446	7,844	10,513	14,031	20,793	28,446	30,103		
Distribution by size of company: [Based on number of employees]														
Total.....	\$58,650	\$65,268	\$74,800	\$84,239	\$87,823	\$92,155	\$97,015	\$102,055	\$109,727	\$116,952	\$121,314			
Fewer than 500 2/.....	2,934	4,422	4,402	5,866	7,071	7,163	(S)	7,809						
500 to 999 3/.....	N/A	N/A	1,439	1,648	1,902	1,725	1,669	1,825	2,154	2,154	13,172	14,496		
1,000 to 4,999.....	3,864	4,178	5,520	6,240	7,472	7,262	7,622	7,881	8,411	8,411	8,000	8,410		
5,000 to 9,999.....	2,751	2,798	3,251	4,022	4,251	4,501	5,245	5,756	6,746	6,746	10,453	12,415		
10,000 to 24,999.....	7,943	9,499	11,351	11,109	10,493	12,043	11,506	10,450	12,486	12,486	8,049	8,672		
25,000 or more.....	41,156	44,372	48,837	55,354	56,991	59,461	63,694	68,334	71,030	71,030	61,508	60,902		

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised.
 These statistics better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development, 1992

Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1992

Page 1 of 2

Industry	SIC code	Total	Size of company				
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees
[Dollars in millions]							
Total.....		\$121,314	\$14,496	\$8,410	\$12,415	\$8,672	\$16,419
Food, kindred, and tobacco products.....		20,21	1,411	72	39	158	184
Textiles and apparel.....		22,23	277	(D)	11	136	(D)
Lumber, wood products, and furniture.....		24,25	(D)	(D)	8	54	39
Paper and allied products.....		26	(D)	50	26	59	(S)
Chemicals and allied products.....		28	16,711	(D)	(D)	2,799	(D)
Industrial chemicals.....		281-82,286	5,406	157	(D)	536	(D)
Drugs and medicines.....		283	8,831	(D)	(D)	(D)	1,911
Other chemicals.....		284-85,287-89	2,474	277	(D)	(D)	4,218
Petroleum refining and extraction.....		13,29	2,339	(D)	2	(S)	(D)
Rubber products.....		30	(D)	(D)	136	(S)	90
Stone, clay, and glass products.....		32	(D)	(D)	15	39	364
Primary metals.....		33	555	51	21	130	(D)
Ferrous metals and products.....		331-32,3398-99	(D)	21	(D)	48	(D)
Nonferrous metals and products.....		333-36	(D)	30	(D)	82	(D)
Fabricated metal products.....		34	1,057	258	42	(D)	49
Machinery.....		35	15,135	1,279	503	1,685	2,198
Office, computing, and accounting machines.....		357	(D)	(D)	288	(D)	(D)
Other machinery, except electrical.....		351-56,358-59	(D)	(D)	215	(D)	(D)
Electrical equipment.....		36	13,546	1,733	(D)	(D)	7,131
Radio and TV receiving equipment.....		365	(D)	19	(D)	(D)	(D)
Communication equipment.....		366	(D)	470	(D)	(D)	0
Electronic components.....		367	3,678	893	(D)	(D)	3,210
Other electrical equipment.....		361-64,369	(D)	351	(D)	(D)	(D)
Transportation equipment.....		37	26,484	34	(D)	(D)	138
Motor vehicles and motor vehicles equipment.....		371	(D)	3	(D)	59	(D)
Other transportation equipment.....		373-75,379	(D)	9	(D)	(D)	(D)
Aircraft and missiles.....		372,376	16,119	22	(D)	147	133

See explanatory information and SOURCE at end of table.

Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1992

Page 2 of 2

Industry	SIC code	Total	Size of company				
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees
[Dollars in millions]							
Professional and scientific instruments.....	38	\$9,652	\$1,157	(D)	\$1,284	(D)	(D)
Scientific and mechanical measuring instruments.....	381-82	5,256	613	(D)	(D)	(D)	\$5,679 (D)
Optical, surgical, photographic, and other instruments.....	384-87	4,396	544	(D)	(D)	360	(D) (D)
Other manufacturing industries.....	27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	(D) 30,103 8,278	210 6,105	(D) 3,199	(D) 2,282	100	(D) (D)

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-5. Total (company, Federal, and other) funds for industrial R&D performance, by industry, size of company, and size of R&D program: 1992

Page 1 of 1

Industry and size of company	SIC code	Total	Size of R&D program				
			Less than \$200,000	\$200,000 to \$999,999	\$1 million to \$9.999 million	\$10 million to \$99.999 million	\$100 million or more
[Dollars in millions]							
Total.....		\$121,314	\$1,064	\$4,507	\$9,666	\$25,107	\$80,970
Distribution by industry:							
Food, kindred, and tobacco products.....	20,21	1,411	(D)	37	202	571	(D)
Textiles and apparel.....	22,23	277	7	28	116	126	0
Lumber, wood products, and furniture.....	24,25	(D)	(D)	42	51	112	0
Paper and allied products.....	26	(D)	(D)	12	144	401	(D)
Chemicals and allied products.....	28	16,711	55	362	560	2,495	13,239
Industrial chemicals.....	281-82,286	5,406	16	10	185	1,118	4,077
Drugs and medicines.....	283	8,831	3	219	132	683	7,794
Other chemicals.....	284-85,287-89	2,474	36	133	243	694	1,368
Petroleum refining and extraction.....	13,29	2,339	7	12	77	574	1,669
Rubber products.....	30	(D)	(D)	35	443	339	479
Stone, clay, and glass products.....	32	(D)	(D)	24	50	277	(D)
Primary metals.....	33	555	10	37	148	360	0
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	69	135	0
Nonferrous metals and products.....	333-36	(D)	(D)	(D)	79	224	0
Fabricated metal products.....	34	1,057	(D)	115	335	397	(D)
Machinery.....	35	15,135	91	497	1,056	2,020	11,471
Office, computing, and accounting machines.....	357	(D)	(D)	(D)	240	896	10,389
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	(D)	816	1,124	1,082
Electrical equipment.....	36	13,546	94	416	1,340	2,685	9,011
Radio and TV receiving equipment.....	365	(D)	(D)	(D)	24	(D)	0
Communication equipment.....	366	(D)	(D)	(D)	383	607	3,912
Electronic components.....	367	3,678	43	183	615	(D)	(D)
Other electrical equipment.....	361-64,369	(D)	(D)	151	318	786	(D)
Transportation equipment.....	37	26,484	5	37	207	701	25,535
Motor vehicles and motor vehicles equipment.....	371	(D)	1	6	128	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	2	7	39	(D)	(D)
Aircraft and missiles.....	372,376	16,119	2	24	40	315	15,738
Professional and scientific instruments.....	38	\$9,652	\$59	\$427	\$890	\$1,942	\$6,334
Scientific and mechanical measuring instruments....	381-82	5,256	43	141	508	1,167	3,397
Optical, surgical, photographic, and other instruments.....	384-87	4,396	16	286	382	775	2,937
Other manufacturing industries.....	27,31,39	(D)	(D)	44	245	333	(D)
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	30,103	557	2,380	3,804	11,774	11,588
Distribution by size of company [Based on number of employees]							
Total.....		\$121,314	\$1,064	\$4,507	\$9,666	\$25,107	\$80,970
Fewer than 500.....		14,510	1,030	4,231	6,145	3,104	0
500 to 999.....		8,410	(D)	124	893	7,104	(D)
1,000 to 4,999.....		12,413	13	122	2,039	7,110	3,129
5,000 to 9,999.....		8,673	1	21	369	2,759	5,523
10,000 to 24,999.....		16,418	0	7	171	3,056	13,184
25,000 or more.....		60,890	(D)	2	49	1,974	(D)

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-6. Number of R&D-performing companies, by industry, size of company, and size of R&D program: 1992

Page 1 of 1

Industry and size of company	SIC code	Total	Size of R&D program				
			Less than \$200,000	\$200,000 to \$999,999	\$1 million to \$9.999 million	\$10 million to \$99.999 million	\$100 million or more
Total.....		36,155	22,392	9,280	3,510	828	145
Food, kindred, and tobacco products.....	20,21	1,273	1,130	70	49	(D)	(D)
Textiles and apparel.....	22,23	180	72	62	39	7	0
Lumber, wood products, and furniture.....	24,25	426	296	104	20	6	0
Paper and allied products.....	26	154	60	20	60	(D)	(D)
Chemicals and allied products.....	28	2,079	1,206	611	156	71	35
Industrial chemicals.....	281-82,286	708	602	19	47	(D)	(D)
Drugs and medicines.....	283	409	56	291	25	18	19
Other chemicals.....	284-85,287-89	962	548	301	84	(D)	(D)
Petroleum refining and extraction.....	13,29	234	157	29	26	16	6
Rubber products.....	30	1,828	1,564	73	176	15	0
Stone, clay, and glass products.....	32	364	254	78	21	(D)	(D)
Primary metals.....	33	323	165	95	49	14	0
Ferrous metals and products.....	331-32,3398-99	120	43	51	20	6	0
Nonferrous metals and products.....	333-36	203	122	44	29	8	0
Fabricated metal products.....	34	735	348	222	149	(D)	(D)
Machinery.....	35	4,889	2,795	1,679	315	78	22
Office, computing, and accounting machines.....	357	970	536	264	109	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	3,919	2,259	1,415	206	(D)	(D)
Electrical equipment.....	36	3,030	1,515	914	486	100	15
Radio and TV receiving equipment.....	365	159	138	13	(D)	(D)	0
Communication equipment.....	366	477	143	168	(D)	(D)	(D)
Electronic components.....	367	1,485	775	413	245	46	6
Other electrical equipment.....	361-64,369	909	459	320	100	(D)	(D)
Transportation equipment.....	37	538	345	73	65	32	23
Motor vehicles and motor vehicles equipment.....	371	64	9	11	31	(D)	(D)
Other transportation equipment.....	373-75,379	84	56	14	11	(D)	(D)
Aircraft and missiles.....	372,376	390	280	48	23	20	19
Professional and scientific instruments.....	38	2,450	1,132	921	309	76	12
Scientific and mechanical measuring instruments.....	381-82	1,307	744	349	169	39	6
Optical, surgical, photographic, and other instruments.....	384-87	1,143	388	572	140	37	6
Other manufacturing industries.....	27,31,39	1,157	947	94	107	9	0
Nonmanufacturing industries	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	16,492	10,406	4,235	1,483	346	22
Distribution by size of company [Based on number of employees]							
Total.....		36,155	22,392	9,280	3,510	828	145
Fewer than 500.....		33,529	22,057	8,740	2,551	181	0
500 to 999.....		883	(D)	250	294	162	(D)
1,000 to 4,999.....		1,171	140	(D)	525	248	(D)
5,000 to 9,999.....		260	10	39	81	102	28
10,000 to 24,999.....		191	8	13	44	88	38
25,000 or more.....		121	(D)	(D)	15	47	53

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
[Dollars in millions]												
Total.....												
Distribution by industry.....												
Food, kindred, and tobacco products 1/.....												
20,21	777	824	1,081	1,136	1,280	1,204	1,173	1,244	1,248	1,277	1,411	
22,23	136	150	182	218	246	243	215	(S)	260	236	259	
24,25	159	152	143	147	144	137	165	192	216	200	(D)	
26	566	552	594	576	538	604	752	879	1,059	1,174	1,191	
28	6,197	6,792	7,736	8,310	8,664	9,445	10,828	11,943	13,168	14,439	16,420	
Lumber, wood products, and furniture.....												
Paper and allied products.....												
Chemicals and allied products.....												
281-82,286	2,810	2,828	3,057	3,281	3,374	3,531	3,939	4,340	4,902	5,225	5,152	
283	2,473	2,896	3,310	3,481	3,657	4,095	4,900	5,512	5,917	6,947	8,822	
284-85,287-89	914	1,068	1,369	1,548	1,633	1,819	1,989	2,091	2,349	2,267	2,447	
Industrial chemicals.....												
Drugs and medicines.....												
Other chemicals.....												
Petroleum refining and extraction.....												
2,003	2,074	2,245	2,194	1,971	1,883	1,975	2,162	2,289	2,487	2,330	1,337	
30	617	638	671	659	655	596	(D)	(D)	538	455	479	
32	472	586	705	825	941	985	697	615	666	717	706	
33	711	701	683	730	786	711	620	666	717	706	542	
Rubber products.....												
Stone, clay, and glass products.....												
Primary metals.....												
Ferrous metals and products.....												
Nonferrous metals and products.....												
333-36	285	305	326	407	450	462	368	422	486	481	318	
331-32,3338-99												
426	396	357	323	323	336	249	252	244	231	225	224	
426	305	305	326	407	450	462	368	422	486	481	318	
Fabricated metal products.....												
34	565	634	773	780	800	633	718	726	736	748	764	
35	7,227	7,911	9,312	10,721	10,701	10,577	11,929	13,342	13,575	13,720	14,073	
Fabricated metal products.....												
357	4,944	5,634	7,011	8,418	8,380	8,193	9,347	10,725	10,988	10,419	10,650	
351-56,3558-59	2,283	2,277	2,301	2,303	2,321	2,384	2,582	2,618	2,587	3,301	3,423	
Office, computing, and accounting machines.....												
Other machinery, except electrical.....												
Electrical equipment.....												
36	6,682	8,158	9,037	9,271	9,767	10,449	9,975	9,575	9,267	8,865	9,689	
Radio and TV receiving equipment.....												
365	364	324	362	350	133	139	(D)	(D)	(D)	(D)	93	
366	3,555	4,500	5,147	5,174	5,117	5,455	4,798	4,159	3,584	(S)	3,435	
367	1,342	1,810	2,354	2,826	3,357	3,630	3,684	3,655	3,496	3,177	3,428	
361-64,3669	1,421	1,524	1,174	921	1,160	1,225	(D)	(D)	(D)	(D)	2,733	
Communication equipment.....												
Electronic components.....												
Other electrical equipment.....												
Transportation equipment.....												
37	8,621	8,991	10,406	12,092	13,567	13,462	13,910	14,596	14,264	14,858	15,726	
Motor vehicles and motor vehicles equipment.....												
371	4,321	4,754	5,384	6,164	7,171	7,167	7,783	8,756	8,594	9,063	(D)	
373-75,3779	114	227	258	279	330	356	361	337	283	262	(D)	
372,376	4,186	4,010	4,764	5,649	6,066	5,939	5,766	5,503	5,387	5,533	6,248	

See explanatory information and SOURCE at end of table.

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
[Dollars in millions]												
Distribution by industry												
Professional and scientific instruments.....	38	\$3,407	\$3,816	\$4,211	\$4,622	\$4,752	\$4,950	\$5,339	\$5,729	\$6,318	\$6,840	\$7,426
Scientific and mechanical measuring instruments.....	381-82	1,363	1,605	1,671	1,596	1,521	1,598	1,863	2,205	2,696	3,017	3,108
Optical, surgical, photographic, and other instruments.....	384-87	2,044	2,211	2,540	3,026	3,231	3,352	3,476	3,524	3,621	3,823	4,318
Other manufacturing industries 1/.....	27,31,39	493	525	373	361	380	380	(D)	(D)	(D)	(D)	(D)
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	1,472	2,084	3,252	4,401	4,740	5,144	7,257	10,302	16,351	22,941	24,211
Distribution by size of company [Based on number of employees]												
Total.....	\$40,105	\$44,588	\$51,404	\$57,043	\$59,932	\$61,403	\$66,672	\$73,501	\$81,602	\$90,580	\$96,654	
Fewer than 500 2/.....	2,411	3,781	3,781	5,127	6,203	6,200	(S)	(S)	(S)	11,285	12,381	
500 to 999 3/.....	N/A	N/A	1,341	1,531	1,765	1,610	1,748	1,934	2,144	7,819	8,232	
1,000 to 4,999.....	3,241	3,438	4,618	5,249	6,243	6,281	6,820	7,546	8,363	9,403	11,259	
5,000 to 9,999.....	2,224	2,080	2,764	3,350	3,455	3,753	4,075	4,509	4,997	7,233	7,821	
10,000 to 24,999.....	6,448	7,228	8,546	8,366	8,489	9,681	10,512	11,631	12,890	12,397	12,960	
25,000 or more.....	25,781	28,061	30,354	33,421	33,778	33,878	40,703	45,106	42,443	44,001		

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

NOTES: Company funds include all funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

KEY:

(D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1992

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Industry	SIC code	Total	Size of company				
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees
[Dollars in millions]							
Total.....		\$96,654	\$12,381	\$8,232	\$11,259	\$7,821	\$12,960
Food, kindred, and tobacco products.....		1,411	72	39	158	184	144
Textiles and apparel.....		259	23	11	136	12	(D)
Lumber, wood products, and furniture.....		(D)	45	8	54	39	(D)
Paper and allied products.....		1,191	50	26	59	43	(S)
Chemicals and allied products.....		16,420	802	469	2,792	1,528	6,481
Industrial chemicals.....		5,152	157	(D)	530	627	(D)
Drugs and medicines.....		8,822	372	(D)	1,880	621	(D)
Other chemicals.....		2,447	273	253	382	280	(D)
Petroleum refining and extraction.....		2,330	88	2	175	(S)	242
Rubber products.....		1,337	365	136	(S)	(D)	90
Stone, clay, and glass products.....		479	38	15	39	(D)	(D)
Primary metals.....		542	51	21	126	(D)	112
Ferrous metals and products.....		224	21	(D)	48	62	(D)
Nonferrous metals and products.....		318	30	(D)	78	(D)	(D)
Fabricated metal products.....		764	215	40	171	121	217
Machinery.....		14,073	1,193	502	1,668	(S)	1,181
Office, computing, and accounting machines.....		357	356	287	861	(D)	(D)
Other machinery, except electrical.....		10,650	837	215	807	(D)	(D)
Electrical equipment.....		9,689	1,641	350	1,626	673	1,829
Radio and TV receiving equipment.....		93	19	(D)	42	0	(D)
Communication equipment.....		3,435	454	(D)	540	0	(D)
Electronic components.....		3,428	845	221	760	(D)	(D)
Other electrical equipment.....		2,733	323	(D)	284	(D)	211
Transportation equipment.....		15,726	34	56	157	426	687
Motor vehicles and motor vehicles equipment.....		(D)	3	25	59	271	(D)
Other transportation equipment.....		(D)	9	(D)	(D)	(D)	(D)
Aircraft and missiles.....		6,248	22	(D)	(D)	(D)	5,448

See explanatory information and SOURCE at end of table.

Table A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1992

Page 2 of 2

Industry	SIC code	Total	Size of company				25,000 or more employees
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	
[Dollars in millions]							
Professional and scientific instruments.....	38	\$7,426	\$1,114	\$510	\$1,141	\$556	\$229
Scientific and mechanical measuring instruments.....	381-82	3,108	576	(D)	679	196	(D)
Optical, surgical, photographic, and other instruments.....	384-87	4,318	538	(D)	462	360	(D)
Other manufacturing industries.....	27,31,39	(D) 24,211	149 6,501	(D) 6022	191 2,380	100 940	(D) 6685
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 70-73, 75-76, 78-79, 80-81, 83-84, 87, 89						

KEY:
(D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

**Table A-9. Company-financed R&D performed outside the United States by U.S. domestic companies and their foreign subsidiaries,
by selected industry: 1982-92**

Industry	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
[Dollars in millions]												
Total.....		\$3,094	\$3,269	\$3,633	\$3,650	\$4,624	\$5,226	\$6,208	\$6,706	\$7,952	\$9,147	\$9,981
Food, kindred, and tobacco products 1/.....	20,21	64	63	70	75	69	37	42	41	66	2,401	68
Chemicals and allied products.....	28	682	729	786	843	1,071	1,243	1,548	1,532	2,007	2,401	2,683
Industrial and other chemicals.....	281-82,284-89	319	368	385	444	579	625	855	609	720	1,009	1,042
Drugs and medicines.....	283	363	361	401	399	492	618	693	923	1,287	1,392	1,641
Petroleum refining and extraction.....	13,29	133	103	101	47	40	47	59	47	76	107	119
Stone, clay, and glass products.....	32	10	19	60	(D)	(D)	(D)	(D)	(D)	59	38	41
Primary metals.....	33	9	10	9	(D)	(D)	(D)	18	23	24	26	20
Fabricated metal products.....	34	25	23	21	21	26	40	(D)	(D)	95	86	98
Machinery.....	35	494	577	740	689	951	1,233	1,326	1,432	1,451	1,476	1,450
Electrical equipment.....	36	467	482	537	591	(S)	432	591	573	770	651	554
Radio and TV receiving equipment.....	365	(T)	(T)	(D)	(D)	(D)	0	(D)	(D)	(D)	2	(D)
Communication equipment.....	366	38	(T)	(D)	(D)	(D)	0	(D)	(D)	199	174	151
Electronic components.....	367	43	38	30	92	117	150	204	246	160	185	180
Other electrical equipment.....	361-64,369	43	38	30	24	25	39	(D)	(D)	160	185	169
Transportation equipment.....	37	843	880	907	1,025	(D)	(D)	1,750	1,916	2,055	2,402	(D)
Motor vehicles and other transportation equipment.....	371,373-75,379	(T)	(T)	(D)	(D)	(D)	(D)	1,477	1,501	1,901	2,166	(D)
Aircraft and missiles.....	372,376	(T)	(T)	(D)	(D)	182	237	273	415	154	236	406
Professional and scientific instruments.....	38	237	(T)	263	169	212	317	404	474	611	656	700
Other manufacturing industries 1/.....	22-27,30-31,39	123	92	131	125	141	138	178	269	344	467	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	7	10	8	18	27	64	146	256	415	778	860

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

NOTE: Data are reported in current U.S. dollars.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-10. Federal funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
[Dollars in millions]												
Total.....												
Distribution by industry		\$18,545	\$20,680	\$23,396	\$27,196	\$27,891	\$30,752	\$30,343	\$28,554	\$28,125	\$26,372	\$24,660
Food, kindred, and tobacco products 1/.....	20,21	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0
Textiles and apparel.....	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)
Lumber, wood products, and furniture.....	24,25	0	0	0	0	0	0	0	0	0	0	(D)
Paper and allied products.....	26	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products.....	28	407	393	191	230	179	190	238	126	123	209	(S)
Industrial chemicals.....	281-82,286	396	386	183	217	178	185	232	111	109	165	(S)
Drugs and medicines.....	283	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)
Petroleum refining and extraction.....	13,29	(D)	(D)	(D)	(D)	(D)	(D)	(D)	14	22	(S)	11
Rubber products.....	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products.....	32	(D)	(D)	(D)	(D)	(D)	(D)	(D)	10	10	(D)	(D)
Primary metals.....	33	276	384	(D)	(D)	(D)	(D)	19	19	17	22	(D)
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1	(D)	1	(D)
Nonferrous metals and products.....	333-36	(D)	(D)	(D)	(D)	(D)	(D)	(D)	16	(D)	7	(D)
Fabricated metal products.....	34	60	67	69	49	95	150	163	178	203	226	293
Machinery,.....	35	851	1,116	1,192	1,495	(D)	(D)	(D)	(D)	(D)	871	1,055
Office, computing, and accounting machines.....	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other machinery, except electrical.....	351-56,3558-59	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electrical equipment.....	36	4,241	4,741	5,161	5,213	5,399	4,153	3,743	4,133	4,550	3,857	
Radio and TV receiving equipment.....	365	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	0	0	(D)
Communication equipment.....	366	2,284	2,798	3,538	4,223	4,552	4,729	(D)	(D)	(D)	(D)	(D)
Electronic components.....	367	398	359	477	559	(D)	656	(D)	(D)	(D)	(D)	250
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	(D)	(D)	(D)	14	(D)	(D)	(D)	(D)
Transportation equipment.....	37	(D)	(D)	(D)	(D)	17,708	20,784	20,865	19,262	17,097	12,570	10,738
Motor vehicles and motor vehicles equipment.....	371	476	564	673	820	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	9,872
Aircraft and missiles.....	372,376	10,265	11,396	14,094	16,582	14,984	18,519	18,402	16,828	15,248	11,096	

See explanatory information and SOURCE at end of table.

Table A-10. Federal funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	[Dollars in millions]							1991	1992
		1982	1983	1984	1985	1986	1987	1988		
Professional and scientific instruments.....	38	\$523	\$450	\$391	\$391	\$351	\$272	\$191	\$263	\$737
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	\$2,226
Optical, surgical, photographic, and other instruments.....	384-87	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2,147
Other manufacturing industries 1/.....	27,31,39	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	79
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	1,000	1,253	1,653	2,313	2,706	2,700	3,256	3,729	4,442
Distribution by size of company [Based on number of employees]										
Total.....	\$18,545	\$20,680	\$23,396	\$27,196	\$27,891	\$30,752	\$30,343	\$28,554	\$28,125	\$26,372
Fewer than 500 2/.....	523	641	621	739	868	963	816	901	895	1,887
500 to 999 3/.....	N/A	N/A	98	117	137	115	131	97	(S)	181
1,000 to 4,999.....	623	740	902	991	1,229	981	1,093	958	881	1,050
5,000 to 9,999.....	527	718	487	672	796	748	864	740	257	1,156
10,000 to 24,999.....	1,495	2,271	2,805	2,743	2,004	2,362	1,705	1,129	1,526	816
25,000 or more.....	15,377	16,311	18,483	21,933	23,213	25,583	25,734	24,709	24,436	3,373
										3,459
										16,901

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-11. Federal funds for industrial R&D performance, by industry and size of company: 1992

Page 1 of 1

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
[Dollars in millions]								
Total.....		\$24,660	\$2,115	\$178	\$1,156	\$851	\$3,459	\$16,901
Food, kindred, and tobacco products.....	20,21	0	0	0	0	0	0	0
Textiles and apparel.....	22,23	(S)	(D)	0	0	(D)	0	(D)
Lumber, wood products, and furniture.....	24,25	(D)	(D)	0	0	0	0	(D)
Paper and allied products.....	26	(D)	0	0	0	0	0	(D)
Chemicals and allied products.....	28	(S)	(D)	(D)	7	(D)	(D)	(D)
Industrial chemicals.....	281-82,286	(S)	0	(D)	6	(D)	(D)	(D)
Drugs and medicines.....	283	(S)	(D)	0	(D)	(D)	(D)	0
Other chemicals.....	284-85,287-89	(S)	(S)	(D)	(D)	(D)	(D)	0
Petroleum refining and extraction.....	13,29	9	(D)	0	(D)	0	(D)	8
Rubber products.....	30	(D)	(D)	0	0	0	0	0
Stone, clay, and glass products.....	32	(D)	(D)	0	0	0	(D)	(D)
Primary metals.....	33	(S)	0	0	4	(D)	(S)	(D)
Ferrous metals and products.....	331-32,3398-99	(D)	0	0	0	(D)	(D)	0
Nonferrous metals and products.....	333-36	(D)	0	0	4	0	(D)	(D)
Fabricated metal products.....	34	293	43	2	(D)	(D)	(D)	0
Machinery.....	35	1,062	79	0	(S)	(D)	(D)	(D)
Office, computing, and accounting machines.....	357	(D)	(D)	0	(D)	(D)	0	(D)
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	0	(D)	0	(D)	(D)
Electrical equipment.....	36	3,857	93	(D)	(D)	(D)	(D)	3,560
Radio and TV receiving equipment.....	365	(D)	0	0	(D)	0	0	0
Communication equipment.....	366	(D)	16	0	(D)	0	(D)	(D)
Electronic components.....	367	250	47	(D)	(D)	(D)	0	(D)
Other electrical equipment.....	361-64,369	(D)	28	0	(D)	(D)	(D)	(D)
Transportation equipment.....	37	10,738	0	(D)	(D)	(D)	1,918	8,771
Motor vehicles and motor vehicles equipment.....	371	(D)	0	(D)	0	(D)	0	(D)
Other transportation equipment.....	373-75,379	(D)	0	0	0	0	0	(D)
Aircraft and missiles.....	372,376	9,872	0	0	(D)	(D)	1,918	7,890
Professional and scientific instruments.....	38	\$2,226	\$44	(D)	\$143	(D)	(D)	\$1,803
Scientific and mechanical measuring instruments....	381-82	2,147	37	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments.....	384-87	79	(S)	(D)	(D)	0	0	(D)
Other manufacturing industries.....	27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	(D) 5,892	61 1,770	0 83	(D) (S)	0 600	(D) (D)	1 (D)

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-12. Number of R&D-performing companies reporting Federal R&D funds and total number of R&D-performing companies, by industry and size of company: 1992

Page 1 of 2

Industry	SIC code	Size of company									
		Fewer than 500 employees			500 to 999 employees			1,000 to 4,999 employees			5,000 to 9,999 employees
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Total.....	33,529	896	883	25	1,171	77	260	41	191	37	121
Food, kindred, and tobacco products.....	20,21	1,126	0	40	0	63	0	21	0	13	0
Textiles and apparel.....	22,23	79	(D)	30	0	55	0	(D)	9	0	10
Lumber, wood products, and furniture.....	24,25	356	(D)	0	0	33	0	7	0	6	0
Paper and allied products.....	26	48	0	54	0	28	0	9	0	10	0
Chemicals and allied products.....	28	1,893	72	61	(D)	74	(D)	18	(D)	24	7
Industrial chemicals.....	281-82,286	634	0	25	(D)	28	7	(D)	(D)	10	(D)
Drugs and medicines.....	283	368	6	8	0	17	(D)	(D)	(D)	0	(D)
Other chemicals.....	284-85,287-89	891	66	28	(D)	29	(D)	(D)	(D)	0	(D)
Petroleum refining and extraction.....	13,29	201	(D)	(D)	0	11	0	(D)	(D)	0	(D)
Rubber products.....	30	1,736	(D)	35	0	50	0	(D)	0	6	(D)
Stone, clay, and glass products.....	32	309	(D)	19	0	24	(D)	(D)	(D)	0	(D)
Primary metals.....	33	214	35	40	0	48	(D)	11	(D)	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	69	0	9	0	30	0	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	145	0	31	0	18	3	(D)	0	(D)	0
Fabricated metal products.....	34	574	73	65	(D)	73	(D)	11	(D)	12	(D)
Machinery.....	35	4,600	87	116	0	135	(D)	19	(D)	11	(D)
Office, computing, and accounting machines.....	357	855	2	42	0	53	(D)	12	(D)	0	(D)
Other machinery, except electrical.....	351-56,358-59	3,745	85	74	0	82	(D)	7	0	(D)	0
Electrical equipment.....	36	2,785	253	86	(D)	124	12	14	(D)	13	(D)
Radio and TV receiving equipment.....	365	153	0	(D)	0	(D)	0	0	(D)	0	(D)
Communication equipment.....	366	430	22	(D)	0	(D)	0	0	(D)	0	(D)
Electronic components.....	367	1,399	202	29	(D)	47	(D)	7	(D)	0	(D)
Other electrical equipment.....	361-64,369	803	29	41	0	47	(D)	7	(D)	0	(D)
Transportation equipment.....	37	390	(D)	37	(D)	62	13	25	6	12	(D)
Motor vehicles and motor vehicles equipment.....	371	10	(D)	7	0	(D)	0	(D)	0	(D)	(D)
Other transportation equipment.....	373-75,379	64	0	10	(D)	30	13	9	(D)	0	(D)
Aircraft and missiles.....	372,376	316	(D)	20	(D)	30	13	7	(D)	9	8

See explanatory information and SOURCE at end of table.

Table A-12. Number of R&D-performing companies reporting Federal R&D funds and total number of R&D-performing companies, by industry and size of company: 1992

Industry	SIC code	Size of company								Total	Federal
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees			
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Professional and scientific instruments	38	2,282	21	75	7	72	10	8	(D)	(D)	(D)
Scientific and mechanical measuring instruments.....	381-82	1,229	(D)	30	(D)	37	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments.....	384-87	1,053	(D)	45	(D)	35	(D)	0	(D)	0	(D)
Other manufacturing industries.....	27,31,39	1,063	40	27	0	50	(D)	9	(D)	0	(D)
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	15,873	338	171	11	271	35	89	24	51	40
											9

Key: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-13. Industry-administered federally funded R&D centers (FFRDCs)--funds by character of work, full-time-equivalent (FTE) R&D scientists and engineers, and total number of employees: 1990-92

[Dollars in millions]

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Item	1990	1991	1992
Total R&D funds.....	\$2,764	\$2,722	\$2,746
Basic research.....	499	461	475
Applied research.....	488	428	502
Development.....	1,777	1,833	1,769
Number of FTE R&D scientists and engineers 1/	\$15,205	\$14,890	\$14,333
Total employees 2/.....	42,007	43,839	44,395

1/ These data were recorded in January of the year following the year indicated.

2/ These data were recorded in March of the year indicated.

NOTE: Industry-administered Federally funded research and development centers (FFRDCs) conduct R&D almost exclusively for use by the Federal Government. Data for these FFRDCs administered by industry are included in Federal R&D support under the industry classifications of the administering firms. See the technical notes for a listing of industry-administered FFRDCs and their locations.
As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-14. Number of R&D-performing companies in manufacturing and nonmanufacturing industries, by size of company: 1992

Size of company [Based on number of employees]	Total	Manufacturing	Nonmanufacturing
Total.....	36,155	19,660	16,495
Fewer than 500.....	33,529	17,656	15,873
500 to 999.....	883	712	171
1,000 to 4,999.....	1,171	900	271
5,000 to 9,999.....	260	171	89
10,000 to 24,999.....	191	140	51
25,000 or more.....	121	81	40

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-15. Concentration of total, Federal, and company and other R&D funds and net sales of R&D-performing companies, by size of R&D program: 1982-92

Page 1 of 1

Companies ranked by size of R&D program	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Percent of total (company, Federal, and other) R&D funds ranked by size of total R&D funds											
First 4 (1-4).....	20	19	17	18	19	19	18	19	18	16	15
Next 4 (5-8).....	12	11	13	12	11	12	12	13	13	8	8
Next 12 (9-20).....	19	17	17	17	14	16	17	16	15	12	13
Next 20 (21-40).....	13	13	13	13	12	12	12	12	12	11	12
Next 60 (41-100).....	16	17	18	16	15	14	15	15	16	15	15
Next 100 (101-200).....	9	9	9	9	10	8	8	8	9	12	12
Next 200 (201-400).....	6	6	6	5	8	6	7	6	7	6	6
Percent of Federal R&D funds ranked by size of Federal R&D funds											
First 4 (1-4).....	N/A	N/A	30	29	30	31	32	36	38	14	14
Next 4 (5-8).....	N/A	N/A	15	15	16	18	18	15	16	21	19
Next 12 (9-20).....	N/A	N/A	26	27	28	27	28	30	26	21	21
Next 20 (21-40).....	N/A	N/A	17	16	15	15	15	11	12	15	17
Next 60 (41-100).....	N/A	N/A	10	7	7	7	6	6	6	13	13
Next 100 (101-200).....	N/A	N/A	1	2	2	1	3	1	3	3	(S)
Next 200 (201-400).....	N/A	N/A	0	0	1	0	0	0	0	2	2
Percent of company and other (except Federal) R&D funds ranked by size of company and other R&D funds											
First 4 (1-4).....	N/A	N/A	22	23	20	20	21	22	21	17	16
Next 4 (5-8).....	N/A	N/A	8	7	7	7	7	7	7	(S)	(S)
Next 12 (9-20).....	N/A	N/A	12	12	12	12	12	13	12	10	(S)
Next 20 (21-40).....	N/A	N/A	12	12	10	11	12	12	13	10	(S)
Next 60 (41-100).....	N/A	N/A	18	18	16	16	16	16	17	16	16
Next 100 (101-200).....	N/A	N/A	11	10	10	10	10	10	10	15	15
Next 200 (201-400).....	N/A	N/A	7	7	8	8	8	8	8	7	7
Percent of net sales ranked by size of total R&D funds											
First 4 (1-4).....	N/A	N/A	7	8	8	7	7	6	8	7	7
Next 4 (5-8).....	N/A	N/A	4	4	5	5	5	5	4	3	4
Next 12 (9-20).....	N/A	N/A	5	5	5	5	5	5	5	4	4
Next 20 (21-40).....	N/A	N/A	8	8	7	7	6	5	5	4	4
Next 60 (41-100).....	N/A	N/A	12	12	10	11	11	12	12	12	12
Next 100 (101-200).....	N/A	N/A	13	13	10	8	9	8	9	9	9
Next 200 (201-400).....	N/A	N/A	14	15	9	12	10	11	12	11	11

KEY: N/A = Not available

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-16. Domestic net sales of R&D-performing companies, by industry and size of company: 1991-92

Industry	SIC code	Total	Size of company				25,000 or more employees
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	
[Dollars in millions]							
							1991
Total.....		\$2,939,040	\$283,016	\$88,069	\$400,422	\$312,691	\$552,226
Food, kindred, and tobacco products.....	20,21	254,333	7,373	5,987	38,063	29,746	44,836
Textiles and apparel.....	22,23	39,041	2,195	(D)	10,665	3,376	128,328
Lumber, wood products, and furniture.....	24,25	110,891	4,228	1,229	8,250	3,616	(D)
Paper and allied products.....	26	110,152	2,414	11,830	10,320	9,072	45,038
Chemicals and allied products.....	28	271,027	27,341	10,888	44,396	30,354	87,543
Industrial chemicals.....	281-82,286	118,243	2,890	6,212	18,672	13,642	41,447
Drugs and medicines.....	283	78,029	15,301	(D)	12,389	5,514	32,666
Other chemicals.....	284-85,287-89	74,755	9,150	(D)	13,335	11,198	13,410
Petroleum refining and extraction.....	13,29	241,341	2,331	400	7,987	15,547	54,737
Rubber products.....	30	49,739	14,176	(D)	14,291	3,940	4,817
Stone, clay, and glass products.....	32	27,741	2,156	(D)	3,874	2,792	14,205
Primary metals.....	33	87,303	4,989	(D)	18,547	13,926	20,997
Ferrous metals and products.....	331-32,3398-99	48,599	2,465	(D)	11,392	7,218	8,529
Nonferrous metals and products.....	333-36	38,704	2,524	(D)	7,155	6,708	12,468
Fabricated metal products.....	34	63,205	8,665	4,835	16,830	10,443	22,432
Machinery.....	35	182,426	28,937	10,060	37,097	22,663	20,084
Office, computing, and accounting machines.....	357	69,988	2,983	(D)	8,661	14,059	0
Other machinery, except electrical.....	351-56,358-59	112,438	25,954	(D)	28,436	8,604	38,657
Electrical equipment.....	36	207,759	35,059	6,981	30,661	12,867	24,928
Radio and TV receiving equipment.....	365	10,677	710	(D)	874	0	53,318
Communication equipment.....	366	46,126	4,264	(D)	6,399	0	27,292
Electronic components.....	367	44,019	8,639	2,522	12,637	7,993	(D)
Other electrical equipment.....	361-64,369	106,937	21,446	3,179	10,751	4,874	13,369
Transportation equipment.....	37	370,104	2,457	2,570	25,614	35,958	29,041
Motor vehicles and motor vehicles equipment.....	371	220,622	493	805	20,859	(D)	274,464
Other transportation equipment.....	373-75,379	12,307	805	751	1,091	(D)	(D)
Aircraft and missiles.....	372,376	137,175	1,159	1,014	3,664	5,602	108,078

See explanatory information and SOURCE at end of table.

Table A-16. Domestic net sales of R&D-performing companies, by industry and size of company: 1991-92

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Industry	SIC code	Total	Size of company						
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees		
[Dollars in millions]									
1991									
Professional and scientific instruments.....	38	\$95,962	\$12,162	\$4,940	\$17,730	\$5,706	\$5,337		
Scientific and mechanical measuring instruments.....	381-82	48,108	7,032	(D)	9,690	2,595	(D)		
Optical, surgical, photographic, and other instruments.....	384-87	47,854	5,130	(D)	8,040	3,111	(D)		
Other manufacturing industries.....	27,31-39	62,831	26,559	2,128	12,496	5,761	6,794		
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	853,185 101,974	13,833	103,601	106,923	157,774	369,080		
Total.....		\$3,063,469	\$299,818	\$93,371	\$427,159	\$330,318	\$578,204		
Food, kindred, and tobacco products.....	20,21	263,422	11,843	6,139	40,122	29,062	\$1,334,599		
Textiles and apparel.....	22,23	43,066	2,001	2,537	12,330	3,584	128,973		
Lumber, wood products, and furniture.....	24,25	24,874	4,499	1,361	9,271	3,946	(D)		
Paper and allied products.....	26	114,369	2,285	11,927	10,860	10,023	(D)		
Chemicals and allied products.....	28	279,395	27,079	11,821	45,866	32,335	46,681		
Industrial chemicals.....	281-82,286	117,517	3,095	6,398	17,544	13,856	71,846		
Drugs and medicines.....	283	82,421	13,908	(D)	13,374	6,526	35,686		
Other chemicals.....	284-85,287-89	79,657	10,076	(D)	14,888	11,953	13,890		
Petroleum refining and extraction.....	13,29	237,516	2,570	498	8,295	15,910	56,655		
Rubber products.....	30	52,926	15,399	(D)	14,783	4,339	4,933		
Stone, clay, and glass products.....	32	28,815	2,188	(D)	4,269	2,741	14,272		
Primary metals.....	33	88,877	4,577	(D)	20,869	14,781	20,992		
Ferrous metals and products.....	331-32,33998-99	48,645	1,985	(D)	12,261	7,986	8,282		
Nonferrous metals and products.....	333-36	40,232	2,592	(D)	8,608	6,795	12,710		
Fabricated metal products.....	34	68,185	11,059	5,189	17,393	10,870	23,674		
							0		

See explanatory information and SOURCE at end of table.

Table A-16. Domestic net sales of R&D-performing companies, by industry and size of company: 1991-92

Industry	SIC code	Total	Size of company					[Dollars in millions]
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	
1992								
Machinery.....	35	\$193,697	\$28,502	\$10,508	\$40,540	\$26,054	\$21,601	\$66,492
Office, computing, and accounting machines.....	357	76,912	2,896	(D)	10,141	17,011	(D)	40,106
Other machinery, except electrical.....	351-56,358-59	116,785	25,606	(D)	30,399	9,043	(D)	26,385
Electrical equipment.....	36	236,605	40,039	7,906	32,346	14,421	40,790	101,103
Radio and TV receiving equipment.....	365	13,658	700	(D)	1,055	0	(D)	0
Communication equipment.....	366	48,692	4,890	(D)	6,976	0	(D)	(D)
Electronic components.....	367	47,864	9,734	2,685	13,007	8,983	(D)	(D)
Other electrical equipment.....	361-64,369	126,591	24,715	3,626	11,309	5,438	14,533	67,000
Transportation equipment.....	37	380,434	2,079	3,195	28,073	36,134	29,050	281,903
Motor vehicles and motor vehicles equipment.....	371	229,949	250	924	23,718	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	13,742	935	1,185	1,317	(D)	(D)	(D)
Aircraft and missiles.....	372,376	136,743	894	1,086	3,038	5,800	16,688	109,267
Professional and scientific instruments.....	38	102,522	14,357	6,100	18,588	6,756	5,165	51,556
Scientific and mechanical measuring instruments.....	381-82	49,892	8,149	(D)	9,833	2,569	(D)	23,742
Optical, surgical, photographic, and other instruments.....	384-87	52,630	6,208	(D)	8,755	4,187	(D)	27,814
Other manufacturing industries.....	27,31-39	60,989	25,941	(D)	12,865	7,068	7,049	164,591
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	887,577	105,420	14,127	110,749	112,298	(D)	380,392

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

**Table A-17. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies,
by industry and size of company: 1982-1992**

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total.....		3.8%	3.9%	3.9%	4.4%	4.7%	4.6%	4.5%	4.3%	4.2%	4.2%	4.2%
Distribution by industry:												
Food, kindred, and tobacco products 1/	2021	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0.5
Textiles and apparel.....	2223	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture.....	2425	0.8	0.8	0.7	0.8	0.6	0.6	0.6	0.8	1.0	1.1	1.1
Paper and allied products.....	26	1.1	(D)	(D)	(D)	(D)	(D)	(D)	5.3	5.3	5.4	6.0
Chemicals and allied products.....	28	4.3	4.4	4.7	5.0	5.2	5.3	5.4	5.3	5.4	5.4	6.0
Industrial chemicals.....	281-32,286	4.0	3.9	4.0	4.4	4.6	4.7	4.4	4.2	4.5	4.6	4.6
Drugs and medicines.....	283	(D)	(D)	(D)	(D)	(D)	(D)	(D)	8.8	(D)	8.9	10.7
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	(D)	(D)	(D)	(D)	3.4	(D)	3.1	3.1
Petroleum refining and extraction.	1329	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1.0	1.0	0.9	1.0
Rubber products.....	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0.9	0.9	(D)	(D)
Stone, clay, and glass products.....	32	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2.6	(D)	(D)	(D)
Primary metals.....	33	1.1	1.3	(D)	(D)	(D)	(D)	(D)	0.9	0.8	0.8	0.8
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0.8	0.8	0.8	0.8
Nonferrous metals and products.....	333-36	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0.9	0.9	(D)	(D)
Fabricated metal products.....	34	1.3	1.4	1.5	1.5	1.5	1.5	1.5	1.3	1.5	1.4	1.5
Machinery.....	35	5.6	6.2	6.4	7.6	7.6	(D)	(D)	7.7	7.9	7.7	8.1
Office, computing, and accounting machines.....	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	3.0	(D)	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	(D)	(D)	(D)	(D)	(D)	3.0	(D)	(D)	(D)
Electrical equipment.....	36	7.2	7.9	6.8	7.6	7.9	8.2	7.5	7.3	6.5	6.5	5.7
Radio and TV receiving equipment.....	365	(D)	(D)	(D)	(D)	(D)	(D)	(D)	3.2	(D)	(D)	(D)
Communication equipment.....	366	11.0	11.5	9.8	10.1	9.9	10.2	(D)	9.0	(D)	(D)	(D)
Electronic components.....	367	6.8	7.7	7.8	9.6	(D)	10.0	(D)	2.7	(D)	(D)	(D)
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	(D)	(D)	(D)	(D)	8.3	(D)	(D)	(D)
Transportation equipment.....	37	N/A	N/A	(D)	(D)	8.3	8.7	8.9	8.1	7.5	7.3	7.0
Motor vehicles and motor vehicles equipment.....	371	4.5	4.0	3.4	3.8	(D)	(D)	(D)	14.7	16.3	13.5	11.8
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	(D)	15.4	17.1	(D)	14.9	15.2	12.1	11.8
Aircraft and missiles.....	372,376											

See explanatory information and SOURCE at end of table.

**Table A-17. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies,
by industry and size of company: 1982-1992**

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Professional and scientific instruments.....	38	8.4%	8.6%	8.3%	8.9%	8.8%	7.9%	7.4%	7.2%	8.0%	9.1%	8.9%
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	(D)	(D)	(D)	(D)	7.9	7.4	8.6	10.0	10.5
Optical, surgical, photographic, and other instruments.....	384-87	(D)	(D)	(D)	(D)	(D)	(D)	7.3	7.3	7.7	8.1	8.4
Other manufacturing industries 1/.....	27,31,39	(D)	(D)	(D)	(D)	1.2	(D)	(D)	(D)	(D)	(D)	(D)
Distribution by size of company [Based on number of employees]												
Fewer than 500 2/.....		1.8	2.5	2.9	3.6	4.1	3.9	3.7	3.6	3.4	3.3	3.2
500 to 999 3/.....		N/A	N/A	2.3	2.4	2.4	2.3	1.8	1.8	2.5	2.5	2.9
1,000 to 4,999.....		1.9	2.0	2.2	2.6	2.5	2.6	2.4	2.2	2.0	2.5	2.9
5,000 to 9,999.....		1.7	1.7	1.8	1.9	2.3	2.3	2.3	2.3	2.6	2.9	3.0
10,000 to 24,999.....		2.4	2.8	3.1	3.2	3.1	3.1	2.8	2.7	3.6	3.5	3.5
25,000 or more.....		5.4	5.5	6.2	6.5	6.6	6.3	5.8	5.6	5.6	5.6	5.5

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

**Table A-18. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies,
by industry and size of company: 1982-92**

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total.....												
Distribution by industry												
Food, kindred, and tobacco products 1/.....	20,21	0.4	0.4	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5
Textiles and apparel.....	22,23	0.5	0.4	0.5	0.5	0.5	0.4	0.4	0.5	0.6	0.6	0.6
Lumber, wood products, and furniture.....	24,25	0.8	0.8	0.7	0.8	0.6	0.6	0.6	0.6	0.6	0.6	0.9
Paper and allied products.....	26	1.1	0.9	0.8	0.8	0.7	0.6	0.6	0.8	1.0	1.1	1.0
Chemicals and allied products.....	28	4.0	4.2	4.6	4.9	5.1	5.2	5.4	5.3	5.3	5.3	5.9
Industrial chemicals.....	281-82,286	3.5	3.4	3.8	4.2	4.4	4.2	4.1	4.4	4.4	4.4	4.4
Drugs and medicines.....	283	7.0	7.7	8.2	8.0	8.4	8.7	8.8	8.8	8.9	8.9	10.7
Other chemicals.....	284-85,287-89	2.3	2.5	2.9	3.1	3.3	3.3	3.4	3.9	3.4	3.0	3.1
Petroleum refining and extraction.....	13,29	0.8	0.7	0.7	0.9	1.1	1.0	1.0	0.9	0.9	1.0	1.0
Rubber products.....	30	1.7	1.7	1.9	1.8	1.7	1.6	1.7	1.9	2.1	2.3	2.5
Stone, clay, and glass products.....	32	1.7	1.9	1.9	2.3	2.4	2.5	2.0	1.8	1.7	1.6	1.7
Primary metals.....	33	0.8	0.8	0.9	0.9	1.0	0.9	0.7	0.7	0.8	0.8	0.6
Ferrous metals and products.....	331-32,3398-99	0.6	0.6	0.6	0.5	0.7	0.6	0.5	0.5	0.5	0.5	0.5
Nonferrous metals and products.....	333-36	1.3	1.2	1.2	1.4	1.5	1.3	1.0	1.0	1.2	1.2	1.2
Fabricated metal products.....	34	1.2	1.3	1.4	1.4	1.4	1.2	1.1	1.2	1.1	1.2	1.1
Machinery.....	35	5.0	5.4	5.8	6.7	7.3	7.1	6.8	7.3	7.2	7.5	7.3
Office, computing, and accounting machines.....	357	10.4	10.0	10.5	12.4	12.4	12.3	11.2	13.1	14.4	14.9	13.8
Other machinery, except electrical.....	351-56,358-59	2.4	2.4	2.5	2.6	2.9	3.0	2.8	2.6	2.3	2.9	2.9
Electrical equipment.....	36	4.4	5.0	4.5	4.8	5.1	5.4	5.3	5.2	4.5	4.3	4.1
Radio and TV receiving equipment.....	365	3.3	2.9	3.7	4.3	3.6	3.2	2.4	1.8	1.6	1.0	0.7
Communication equipment.....	366	6.7	7.2	5.1	5.4	5.2	5.5	6.1	6.8	6.1	(S)	7.1
Electronic components.....	367	5.2	6.6	6.6	8.2	9.2	8.5	8.0	7.7	7.4	7.2	7.2
Other electrical equipment.....	361-64,369	2.3	2.6	2.2	2.0	2.2	2.6	2.3	2.3	2.2	2.2	2.2
Transportation equipment.....	37	N/A	N/A	3.3	3.4	3.6	3.4	3.5	3.5	3.4	4.0	4.1
Motor vehicles and motor vehicle equipment.....	371	4.0	3.5	3.0	3.1	3.3	3.4	3.4	3.7	3.7	4.1	4.0
Other transportation equipment.....	373-75,379	0.7	1.7	2.0	2.3	2.7	2.5	2.6	2.1	2.1	2.1	4.6
Aircraft and missiles.....	372,376	5.1	4.1	4.0	3.9	4.0	3.6	3.9	3.3	3.1	4.0	4.6

See explanatory information and SOURCE at end of table.

Table A-18. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Professional and scientific instruments.....	38	7.3	7.7	7.6	8.3	8.2	7.5	7.1	6.8	7.1	7.1	7.2
Scientific and mechanical measuring instruments.	381-82	7.6	8.8	8.3	8.4	8.4	8.1	7.6	6.9	6.9	6.3	6.2
Optical, surgical, photographic, and other instruments.....	384-87	7.1	7.1	7.3	8.1	8.0	7.2	7.1	7.1	7.5	8.0	8.2
Other manufacturing industries 1/.....	27,31,39	0.8	1.0	1.1	1.0	1.2	1.1	1.0	0.9	0.9	0.8	1.0
Distribution by size of company [Based on number of employees]												
Fewer than 500 2/.....		1.6	2.2	2.8	3.4	4.0	3.8	3.7	3.5	3.3	3.2	3.0
500 to 999 3/.....		N/A	N/A	2.2	2.2	2.2	2.2	1.7	1.7	2.4	2.4	2.8
1,000 to 4,999.....		1.7	2.0	2.0	2.4	2.4	2.4	2.3	2.1	1.9	2.4	2.8
5,000 to 9,999.....		1.5	1.3	1.6	1.8	2.0	2.0	2.0	2.1	2.8	2.9	2.8
10,000 to 24,999.....		2.0	2.3	2.5	2.5	2.6	2.5	2.6	2.5	3.0	2.9	2.9
25,000 or more.....		3.3	3.4	3.2	3.5	3.7	3.8	3.7	3.6	3.8	3.6	3.9

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-19. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies by industry and ranked by size of R&D program: 1992

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Industry	SIC code	Total R&D funds as a percent of net sales			Total R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total.....		8.1	7.0	16.4	\$18,792	\$9,758	\$15,334
Food, kindred, and tobacco products.....	20,21	1.2	0.4	0.5	688	157	231
Textiles and apparel.....	22,23	0.9	0.9	0.9	90	44	67
Lumber, wood products, and furniture.....	24,25	2.5	0.7	0.8	91	35	30
Paper and allied products.....	26	3.2	0.9	0.6	828	158	129
Chemicals and allied products.....	28	11.2	8.6	9.4	3,745	2,642	4,261
Industrial chemicals.....	281-82,286	6.7	5.5	3.9	2,811	885	1,051
Drugs and medicines.....	283	17.8	9.4	11.8	3,307	1,959	2,621
Other chemicals.....	284-85,287-89	5.0	2.3	3.0	1,224	341	377
Petroleum refining and extraction.....	13,29	1.5	0.9	0.5	1,333	519	391
Rubber products.....	30	4.9	(S)	2.2	539	(S)	153
Stone, clay, and glass products.....	32	3.3	1.7	1.8	375	106	60
Primary metals.....	33	0.6	1.3	0.8	196	83	131
Ferrous metals and products.....	331-32,3398-99	0.5	0.7	0.8	109	44	44
Nonferrous metals and products.....	333-36	(S)	0.8	0.6	(S)	57	55
Fabricated metal products.....	34	4.2	1.2	1.1	386	107	133
Machinery.....	35	18.3	12.0	9.8	8,042	1,476	1,865
Office, computing, and accounting machines.....	357	18.3	21.0	8.9	8,042	1,219	1,341
Other machinery, except electrical.....	351-56,358-59	5.9	5.2	4.3	973	365	472
Electrical equipment.....	36	7.9	16.1	7.9	5,757	1,882	1,688
Radio and TV receiving equipment.....	365	0.6	4.4	1.7	70	11	12
Communication equipment.....	366	11.9	8.3	11.4	3,357	674	398
Electronic components.....	367	10.0	10.5	11.4	1,440	397	538
Other electrical equipment.....	361-64,369	(D)	2.0	2.1	(D)	246	264
Transportation equipment.....	37	7.1	15.2	10.1	13,822	6,070	4,885
Motor vehicles and motor vehicles equipment.....	371	(D)	1.0	0.8	(D)	186	122
Other transportation equipment.....	373-75,379	(D)	0.7	0.9	(D)	19	15
Aircraft and missiles.....	372,376	15.1	13.2	9.4	8,425	4,651	2,866
Professional and scientific instruments.....	38	11.2	11.4	12.6	\$4,041	\$1,748	\$1,242
Scientific and mechanical measuring instruments.....	381-82	13.9	10.1	13.4	3,024	556	567
Optical, surgical, photographic, and other instruments.....	384-87	9.2	8.5	6.9	2,710	333	346
Other manufacturing industries.....	27,31,39	4.9	3.0	1.1	254	69	74

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: Rankings were based on total (company, Federal, and other) R&D funds.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-20. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and ranked by size of company-financed R&D program: 1992

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Industry	SIC code	Company R&D funds [Percent]			Company R&D funds [Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total.....		6.9	3.6	10.7	\$15,391	(S)	(S)
Food, kindred, and tobacco products.....	20,21	1.0	(S)	0.0	688	(S)	231
Textiles and apparel.....	22,23	1.0	1.0	1.0	80	44	66
Lumber, wood products, and furniture.....	24,25	2.0	1.0	1.0	91	30	29
Paper and allied products.....	26	3.0	(S)	1.0	778	(S)	129
Chemicals and allied products.....	28	11.2	8.6	8.7	3,730	2,643	4,236
Industrial chemicals.....	281-82,286	7.0	4.0	4.0	2,797	692	1,008
Drugs and medicines.....	283	(S)	9.0	12.0	(S)	1,958	2,620
Other chemicals.....	284-85,287-89	5.0	2.0	3.0	1,224	319	376
Petroleum refining and extraction.....	13,29	2.0	1.0	1.0	1,326	518	391
Rubber products.....	30	(S)	(S)	(S)	(S)	(S)	(S)
Stone, clay, and glass products.....	32	2.0	2.0	2.0	266	105	57
Primary metals.....	33	0.6	1.2	0.8	193	78	131
Ferrous metals and products.....	331-32,3398-99	0.0	1.0	1.0	108	44	44
Nonferrous metals and products.....	333-36	(S)	1.0	1.0	(S)	55	51
Fabricated metal products.....	34	2.0	1.0	1.0	169	89	121
Machinery.....	35	16.3	11.9	9.7	7,174	1,466	1,835
Office, computing, and accounting machines.....	357	16.3	(S)	9.0	7,174	(S)	1,337
Other machinery, except electrical.....	351-56,358-59	(S)	5.0	4.0	(S)	320	472
Electrical equipment.....	36	5.3	8.3	5.0	3,642	1,033	1,316
Radio and TV receiving equipment.....	365	1.0	4.0	2.0	69	11	12
Communication equipment.....	366	(S)	8.0	11.0	(S)	666	398
Electronic components.....	367	(S)	10.0	10.0	(S)	389	492
Other electrical equipment.....	361-64,369	(D)	(S)	2.0	(D)	(S)	255
Transportation equipment.....	37	5.6	(S)	2.4	11,385	(S)	1,173
Motor vehicles and motor vehicles equipment.....	371	(D)	1.0	0.8	(D)	186	118
Other transportation equipment.....	373-75,379	(S)	(S)	0.9	(S)	(S)	15
Aircraft and missiles.....	372,376	(D)	(S)	(S)	(D)	(S)	(S)
Professional and scientific instruments.....	38	8.7	7.2	8.4	\$3,150	\$836	\$1,062
Scientific and mechanical measuring instruments.....	381-82	6.0	6.7	(S)	1308	368	(S)
Optical, surgical, photographic, and other instruments.....	384-87	9.0	8.5	6.9	2646	333	345
Other manufacturing industries.....	27,31,39	4.7	3.0	1.1	241	69	73

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: Rankings were based upon company and other (except Federal) R&D funds.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

**Table A-21. Federal R&D funds as a percent of net sales in R&D-performing manufacturing companies,
by industry and ranked by size of federally financed R&D program: 1992**

Page 1 of 1

Industry	SIC code	Federal R&D funds [Percent]			Federal R&D funds [Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total.....		8.4	2.2	7.4	\$5,957	\$3,461	\$5,527
Food, kindred, and tobacco products.....	20,21	0.0	0.0	0.0	0	0	0
Textiles and apparel.....	22,23	(S)	0.0	0.0	(S)	0	0
Lumber, wood products, and furniture.....	24,25	(D)	0.0	0.0	(D)	0	0
Paper and allied products.....	26	(D)	0.0	0.0	(D)	0	0
Chemicals and allied products.....	28	(S)	(S)	0.0	(S)	(S)	14
Industrial chemicals.....	281-82,286	(D)	0.0	0.0	(D)	9	5
Drugs and medicines.....	283	(S)	0.0	(D)	(S)	1	(D)
Other chemicals.....	284-85,287-89	(D)	(S)	0.0	(D)	(S)	0
Petroleum refining and extraction.....	13,29	0.0	0.0	0.0	8	1	0
Rubber products.....	30	(D)	0.0	0.0	(D)	0	0
Stone, clay, and glass products.....	32	(D)	0.0	0.0	(D)	1	0
Primary metals.....	33	(S)	0.0	0.0	(S)	3	0
Ferrous metals and products.....	331-32,3398-99	(D)	0.0	0.0	(D)	0	0
Nonferrous metals and products.....	333-36	(S)	0.0	0.0	(S)	2	0
Fabricated metal products.....	34	5.0	1.0	1.0	246	45	2
Machinery.....	35	(D)	0.5	0.4	(D)	62	47
Office, computing, and accounting machines.....	357	(D)	(D)	0.0	(D)	(D)	0
Other machinery, except electrical.....	351-56,358-59	0.0	(S)	1.0	69	(S)	78
Electrical equipment.....	36	5.3	10.6	1.3	3,241	358	193
Radio and TV receiving equipment.....	365	(D)	0.0	0.0	(D)	0	0
Communication equipment.....	366	(D)	21.0	1.0	(D)	14	3
Electronic components.....	367	3.0	3.0	2.0	195	25	25
Other electrical equipment.....	361-64,369	(D)	1.0	0.0	(D)	30	6
Transportation equipment.....	37	(S)	1.8	8.2	(S)	2,790	2,584
Motor vehicles and motor vehicles equipment.....	371	(D)	0.0	0.0	(D)	0	0
Other transportation equipment.....	373-75,379	(D)	0.0	0.0	(D)	0	0
Aircraft and missiles.....	372,376	(S)	5.3	(S)	(S)	2,677	(S)
Professional and scientific instruments.....	38	9.4	1.5	3.8	\$1,728	\$305	\$168
Scientific and mechanical measuring instruments....	381-82	9.4	4.6	2.9	1728	272	137
Optical, surgical, photographic, and other instruments.....	384-87	(D)	0.4	(D)	(D)	3	(D)
Other manufacturing industries.....	27,31,39	2.8	(D)	0.0	74	(D)	0

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: Rankings were based upon Federal R&D funds.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-22. Total (company, Federal, and other) funds for performance of basic research, applied research, and development, in current and in constant dollars: 1953-92

[Dollars in millions]

Page 1 of 1

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
1953 1/.....	\$3,630	\$16,500	\$151	\$686	\$726	\$3,300	\$2,753	\$12,514
1954 1/.....	4,070	18,333	166	748	814	3,667	3,090	13,919
1955 1/.....	4,640	20,262	189	825	928	4,052	3,523	15,384
1956.....	6,605	27,987	253	1,072	1,268	5,373	5,084	21,542
1957.....	7,731	31,684	271	1,111	1,670	6,844	5,790	23,730
1958.....	8,389	33,691	295	1,185	1,911	7,675	6,183	24,831
1959.....	9,618	37,570	320	1,250	1,991	7,777	7,307	28,543
1960.....	10,509	40,419	376	1,446	2,029	7,804	8,104	31,169
1961.....	10,908	41,475	395	1,502	1,977	7,517	8,537	32,460
1962.....	11,464	42,617	488	1,814	2,449	9,104	8,527	31,699
1963.....	12,630	46,434	522	1,919	2,457	9,033	9,651	35,482
1964.....	13,512	48,780	549	1,982	2,600	9,386	10,363	37,412
1965.....	14,185	49,947	592	2,085	2,658	9,359	10,935	38,504
1966.....	15,548	52,884	624	2,122	2,843	9,670	12,081	41,092
1967.....	16,385	54,076	629	2,076	2,915	9,620	12,841	42,380
1968.....	17,429	54,808	642	2,019	3,124	9,824	13,663	42,965
1969.....	18,308	54,814	618	1,850	3,287	9,841	14,403	43,123
1970.....	18,067	51,327	602	1,710	3,427	9,736	14,038	39,881
1971.....	18,320	49,380	590	1,590	3,415	9,205	14,315	38,585
1972.....	19,552	50,392	593	1,528	3,514	9,057	15,445	39,807
1973.....	21,249	51,450	631	1,528	3,825	9,262	16,793	40,661
1974.....	22,887	50,973	699	1,557	4,288	9,550	17,900	39,866
1975.....	24,187	49,161	730	1,484	4,570	9,289	18,887	38,388
1976.....	26,997	51,620	819	1,566	5,112	9,774	21,066	40,279
1977.....	29,825	53,354	911	1,630	5,636	10,082	23,278	41,642
1978 1/.....	33,304	55,231	1,035	1,716	6,300	10,448	25,969	43,066
1979.....	38,226	58,271	1,158	1,765	7,225	11,014	29,843	45,492
1980 1/.....	44,505	62,071	1,325	1,848	8,450	11,785	34,730	48,438
1981.....	51,810	65,665	1,614	2,046	10,699	13,560	39,497	50,060
1982 1/.....	58,650	69,988	1,904	2,272	12,323	14,705	44,423	53,011
1983.....	65,268	74,849	2,223	2,549	13,927	15,971	49,118	56,328
1984.....	74,800	82,198	2,608	2,866	15,765	17,324	56,427	62,008
1985.....	84,239	89,236	2,862	3,032	18,255	19,338	63,122	66,867
1986.....	87,823	90,633	4,047	4,176	19,759	20,391	64,031	66,079
1987.....	92,155	92,155	4,324	4,324	19,813	19,813	68,016	68,016
1988.....	97,015	93,373	4,500	4,331	20,748	19,969	71,767	69,073
1989.....	102,055	94,060	5,216	4,807	22,691	20,913	74,148	68,339
1990.....	109,727	96,846	5,128	4,526	24,785	21,876	79,814	70,445
1991.....	116,952	99,449	9,423	8,013	26,172	22,255	81,357	69,181
1992.....	121,314	100,342	9,794	8,101	27,175	22,477	84,345	69,764

1/ Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, National Patterns of R&D Resources: 1990, Final Report, NSF 90-316.

NOTES: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

The 1987 GNP implicit price deflator was used to convert current dollars to constant dollars.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Research and Development in Industry: 1992

Table A-23. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1988

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]													
Total.....		\$97,015	\$30,343	\$66,672	\$4,500	\$993	\$3,507	\$20,748	\$4,217	\$16,531	\$71,767	\$25,133	\$46,634
Food, kindred, and tobacco products.....	20,21	(D)	(D)	1,173	(D)	0	(D)	(D)	0	(D)	(D)	(D)	711
Textiles and apparel.....	22,23	(D)	(D)	215	(D)	0	(D)	(D)	0	(D)	(D)	(D)	179
Lumber, wood products, and furniture.....	24,25	(D)	(D)	165	(D)	53	(D)	(D)	0	(D)	(D)	(D)	86
Paper and allied products.....	26	(D)	(D)	752	(D)	58	(D)	(D)	269	425	0	(D)	425
Chemicals and allied products.....	28	11,067	237	10,828	841	14	827	4,366	129	4,237	5,860	96	5,764
Industrial chemicals.....	281-82,286	4,172	231	3,939	313	14	299	(D)	(D)	1,520	(D)	(D)	2,120
Drugs and medicines.....	283	4,906	6	4,900	(S)	0	(S)	(D)	(D)	2,013	(D)	(D)	2,392
Other chemicals.....	284-85,287-89	1,989	0	1,989	33	0	33	704	0	704	1,252	0	1,252
Petroleum refining and extraction.....	13,29	1,997	22	1,975	(D)	78	(D)	(D)	(D)	1,013	898	14	884
Rubber products.....	30	(D)	(D)	718	65	0	65	(D)	(D)	147	(D)	(D)	506
Stone, clay, and glass products.....	32	(D)	(D)	697	138	0	138	(D)	(D)	(S)	193	0	193
Primary metals.....	33	637	17	620	75	0	75	(D)	(D)	221	(D)	(D)	324
Ferrous metals and products.....	331-32,3398-99	253	1	252	3	0	3	(D)	(D)	124	(D)	(D)	125
Nonferrous metals and products.....	333-36	384	16	368	72	0	72	(D)	(D)	97	(D)	(D)	199
Fabricated metal products.....	34	881	163	718	58	0	58	(D)	(D)	169	(D)	(D)	491
Machinery.....	35	(D)	11,929	(D)	242	(D)	(D)	(D)	(D)	2,043	(D)	(D)	9,644
Office, computing, and accounting machines.....	357	(D)	9,347	(D)	163	(D)	(D)	(D)	(D)	1,579	(D)	(D)	7,605
Other machinery, except electrical.....	351-56,358-59	2,682	100	2,552	(S)	0	(S)	(D)	(D)	464	(D)	(D)	2,039
Electrical equipment.....	36	14,128	1,453	9,975	594	21	573	3,317	640	2,677	10,217	3,492	6,725
Radio and TV receiving equipment.....	365	149	0	149	(D)	0	(D)	(D)	0	(D)	676	0	(D)
Communication equipment.....	366	8,427	3,630	4,797	(D)	0	(D)	(D)	0	(D)	7,021	0	(D)
Electronic components.....	367	4,133	449	3,684	(D)	0	(D)	1,883	(D)	(D)	236	1,015	1,831
Other electrical equipment.....	361-64,369	1,419	74	1,345	(S)	0	(S)	236	0	(D)	74	74	941
Transportation equipment.....	37	34,775	20,865	13,910	453	243	210	3,741	1,937	1,804	30,581	18,685	11,896
Motor vehicles and motor vehicles equipment.....	371	(D)	7,783	101	0	101	(S)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	361	0	0	243	99	2,809	1,773	1,036	21,017	16,386	4,631
Aircraft and missiles.....	372,376	24,168	18,402	5,766	342								

See explanatory information and SOURCE at end of table.

Table A-23. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1988

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]													
Professional and Scientific Equipment.....	38	\$5,530	\$191	\$5,339	(D)	\$490	(D)	\$1,132	\$3,860	\$143	\$3,717		
Scientific and mechanical measuring instruments.....	381-82	1,959	(S)	1,863	174	0	174	(D)	(D)	(D)	(D)	1,381	
Optical, surgical, photographic, and other instruments.....	383-87	3,571	95	3,476	(D)	316	(D)	824	(D)	(D)	(D)	2,336	
Other manufacturing industries.....	27,31,39	(D)	10,513	3,256	401	0	(S)	55	55	290	3	287	
Nonmanufacturing industries.....	40-44-51,53-54, 56,60,62-63,72- 73,78,80-07,87	1,253	7,257	702	551	2,868	964	0	1,904	6,392	1,590	4,802	

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld due to imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-24. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1989

Distribution by industry		SIC code	Total			Basic			Applied			Development			
			Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	
[Dollars in millions]															
Total.....			\$102,055	\$28,554	\$73,501	\$5,216	\$1,384	\$3,832	\$22,691	\$4,698	\$17,993	\$74,148	\$22,472	\$51,676	
Food, kindred, and tobacco products.....		20,21	(D)	(D)	(S)	(S)	0	(S)	(D)	437	(D)	729	(D)	(D)	729
Textiles and apparel.....		22,23	(D)	(D)	(S)	(D)	0	(D)	26	175	(D)	167	(D)	167	(D)
Lumber, wood products, and furniture.....		24,25	192	0	(D)	(D)	0	(D)	0	0	0	0	0	0	821
Paper and allied products.....		26	879	0	(D)	(D)	0	(D)	0	0	0	0	0	0	821
Chemicals and allied products.....		28	12,069	126	11,943	945	19	926	4,763	19	4,744	6,361	87	87	6,274
Industrial chemicals.....		281-82,286	4,451	111	4,340	373	19	353	(D)	(D)	(D)	(D)	(D)	(D)	2,306
Drugs and medicines.....		283	(D)	(D)	(S)	(S)	0	(D)	(D)	1,681	(D)	(D)	(D)	(D)	2,732
Other chemicals.....		284-85,287-89	(D)	(D)	2,091	56	0	(S)	(D)	2,263	(D)	(D)	(D)	(D)	1,236
Petroleum refining and extraction.....		13,29	2,180	(S)	2,162	(D)	(D)	111	(D)	(D)	(D)	1,037	18	18	1,019
Rubber products.....		30	(D)	(D)	867	60	0	(D)	60	(D)	(D)	159	(D)	(D)	648
Stone, clay, and glass products.....		32	(D)	(D)	615	(D)	(D)	130	(D)	(D)	(D)	298	(D)	(D)	187
Primary metals.....		33	688	22	666	82	0	(D)	82	(D)	(D)	225	(D)	(D)	358
Ferrous metals and products.....		331-32,3398-99	(D)	(D)	244	(D)	0	(D)	(D)	(D)	(D)	(D)	(D)	(D)	128
Nonferrous metals and products.....		333-36	(D)	(D)	422	(D)	0	(D)	(D)	(D)	(D)	(D)	(D)	(D)	230
Fabricated metal products.....		34	904	178	726	49	0	49	(D)	(D)	(D)	187	(D)	(D)	490
Machinery.....		35	(D)	(D)	13,342	(D)	(D)	(S)	(D)	(D)	(D)	2,764	(D)	(D)	10,312
Office, computing, and accounting machines.....		357	(D)	(D)	10,725	(D)	(D)	(S)	(D)	(D)	(D)	2,311	(D)	(D)	(S)
Other machinery, except electrical.....		351-56,356-59	2,729	112	2,617	91	0	(D)	(D)	453	(D)	2,153	(D)	(D)	2,073
Electrical equipment.....		36	13,318	3,743	9,576	(D)	(D)	(D)	(D)	514	(D)	2,412	9,549	2,899	6,650
Radio and TV receiving equipment.....		365	96	0	96	(D)	0	(D)	(D)	0	(D)	0	(D)	(D)	(D)
Communication equipment.....		366	7,071	2,911	4,160	(D)	0	(D)	(D)	17	(D)	79	(D)	5,711	2,191
Electronic components.....		367	4,025	369	3,655	(D)	17	(D)	(D)	335	(D)	335	(D)	1,638	(D)
Other electrical equipment.....		361-64,369	2,127	463	1,664	(S)	(D)	(D)	(D)	0	(D)	0	1,587	(D)	(D)
Transportation equipment.....		37	33,858	19,262	14,596	660	474	186	3,826	(D)	(D)	29,372	(D)	(D)	(D)
Motor vehicles and motor vehicles equipment.....		371	(D)	(D)	8,756	81	0	81	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....		373-75,379	(D)	(D)	337	6	0	(S)	(D)	0	(D)	0	0	0	1,938
Aircraft and missiles.....		372,376	22,331	16,828	5,503	573	474	474	3,826	(D)	(D)	19,021	1,811	1,811	4,474

See explanatory information and SOURCE at end of table.

Table A-24. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1989

Distribution by industry	SIC code	Basic						Applied			Development			Page 2 of 2
		Total		Federal		Company		Total	Federal	Company	Total	Federal	Company	
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	
[Dollars in millions]														
Professional and Scientific Equipment.....	38	\$5,992	\$263	\$5,729	(D)	(S)	(D)	\$440	\$1,450	\$178	\$1,272	(D)	(D)	\$4,017
Scientific and mechanical measuring instruments.....	381-82	2,366	(S)	2,204	0	(S)	(D)	(S)	(D)	(D)	449	1,612	0	1,612
Optical, surgical, photographic, and other instruments.....	383-87	3,626	101	3,525	(D)	(D)	(D)	296	(D)	(D)	823	(D)	(D)	2,405
Other manufacturing industries.....	27,31,39	(D)	428	(S)	0	(S)	(D)	66	0	66	337	8	328	
Nonmanufacturing industries.....	10-11,14-17,40-42,44-51,53-54,56,58,62-63,72-73,78,806-07,87	14,031	3,729	10,302	1,697	858	3,687	1,159	0	1,159	2,528	8,647	1,712	6,935

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld due to imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-25. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1990

Industry	SIC code	Total			Basic			Applied			Development			Page 1 of 2
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	
[Dollars in millions]														
Total.....		\$109,727	\$28,125	\$81,602	5,128	1,368	(D)	3,760	24,785	6,353	18,432	79,814	20,404	59,410
Food, kindred, and tobacco products.....	20,21	20,21	(D)	1,248	(D)	151	406	42	0	0	406	692	0	692
Textiles and apparel.....	22,23	22,23	(D)	260	(D)	0	(D)	43	1	(D)	42	189	8	181
Lumber, wood products, and furniture.....	24,25	216	0	216	(D)	0	(D)	0	0	(D)	0	109	0	109
Paper and allied products.....	26	1,059	0	1,059	(D)	0	(D)	0	0	(D)	0	725	0	725
Chemicals and allied products.....	28	13,291	123	13,168	(S)	5,369	(S)	50	5,319	(D)	6,987	65	65	6,922
Industrial chemicals.....								358	(D)	(D)	(D)	(D)	(D)	(D)
Drugs and medicines.....	281-82	286	5,010	108	4,902	366	(S)	0	(S)	(D)	(D)	(D)	(D)	(D)
Other chemicals.....	283	283	(D)	5,917	(S)	0	(S)	0	(S)	(D)	(D)	(D)	(D)	(D)
284-85,287-89		2,349	(D)	2,349	(S)	0	(D)	0	(D)	(D)	(D)	0	0	1,507
Petroleum refining and extraction.....	13,29							2,289	(D)	(D)	1,042	8	(D)	(D)
Rubber products.....	30	2,306	(S)	1,056	1,117	0	(D)	117	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products.....	32	(D)	(D)	538	(D)	0	(D)	207	(D)	(D)	(D)	(D)	(D)	(D)
Primary metals.....	33	(D)	(D)	717	(S)	0	(S)	0	(D)	(D)	(D)	387	12	375
Ferrous metals and products.....								231	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	331-32	3398-99	(D)	(D)	0	0	(D)	0	(D)	(D)	(D)	112	1	111
333-36			(D)	486	(D)	0	(D)	0	(D)	(D)	(D)	275	11	264
Fabricated metal products.....	34	939	203	736	64	14	50	235	51	(D)	(D)	138	502	502
Machinery.....	35	14,446	871	13,575	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	10,656
Office, computing, and accounting machines.....	357	(D)	(D)	10,988	(D)	(D)	(D)	(D)	(D)	(D)	(D)	9,199	594	8,606
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	2,587	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2,051
Electrical equipment.....	36	13,400	4,133	9,267	422	130	292	3,646	1,124	2,521	9,332	2,879	6,453	
Radio and TV receiving equipment.....	365	114	0	114	(D)	0	(D)	(D)	(D)	(D)	(D)	76	0	76
Communication equipment.....	366	5,928	2,344	3,584	(D)	(D)	(D)	(D)	(D)	(D)	(D)	4,607	1,685	2,942
Electronic components.....	367	3,914	418	3,496	(D)	(D)	(D)	151	729	(D)	(D)	2,184	233	1,951
Other electrical equipment.....	361-64,369	3,445	1,371	2,074	251	100	100	(D)	290	(D)	(D)	2,465	981	1,484
Transportation equipment.....	37	31,361	17,097	14,284	654	416	238	(D)	(D)	(D)	1,798	(D)	(D)	12,157
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	8,594	110	18	92	976	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	283	8	2	140	396	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	15,248	5,387	536	396	140	2,718	2,009	710	2,718	2,009	12,843	12,843	4,537

See explanatory information and SOURCE at end of table.

Table A-25. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1990

Page 2 of 2

Industry	SIC code	Basic						Applied			Development		
		Total		Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal
		Total	Federal	Company		Total	Federal	Company	Total	Federal	Company	Total	Federal
[Dollars in millions]													
Professional and scientific instruments.....	36	\$7,055	\$650	\$2,696	(D)	(D)	\$389	\$1,505	\$158	\$1,347	(D)	(D)	\$4,478
Scientific and mechanical measuring instruments.....	381-82	3,346	(S)	2,696	(D)	(D)	104	(D)	543	2,564	498	(D)	2,066
Optical, surgical, photographic, and other instruments.....	383-87	3,709	88	3,621	(D)	(D)	285	(D)	804	(D)	(D)	(D)	2,412
Other manufacturing industries.....	27,31,39 10-11,14-17,40- 42,44-51,53-54, 56,60,62-63,72, 73,78,80-87,87	10,793	(D) 4,442	541 16,351	71 2,569	3 549	68 2,021	93 5,195	4 1,110	89 4,085	401 13,029	16 2,783	385 10,245

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld due to imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1991

Table A-26. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1991

Page 1 of 2

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]													
Total.....		\$116,952	\$26,372	\$90,580	\$9,423	\$2,953	\$6,470	\$26,172	\$5,188	\$20,984	\$81,357	\$18,231	\$63,126
Food, kindred, and tobacco products.....	20,21	1,277	0	1,277	112	0	112	478	0	478	687	0	687
Textiles and apparel.....	22,23	(D)	(D)	(D)	236	28	(D)	(D)	28	(D)	38	15	170
Lumber, wood products, and furniture.....	24,25	(D)	(D)	(D)	201	0	(D)	21	0	(D)	74	(D)	107
Paper and allied products.....	26	(D)	(D)	(D)	1,174	0	(D)	(D)	0	(D)	527	0	527
Chemicals and allied products.....	28	14,648	209	14,439	1,695	17	1,678	4,906	(S)	4,802	8,047	88	7,959
Industrial chemicals.....	281-82,286	5,390	165	5,225	(D)	(D)	(D)	627	(D)	(D)	1,371	3,293	66
Drugs and medicines.....	283	(D)	(D)	(D)	6,947	(D)	(D)	919	(D)	(D)	2,654	(D)	3,374
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	2,267	(D)	(D)	132	132	(D)	777	(D)	1,358
Petroleum refining and extraction.....	13,29	2,498	11	2,487	(D)	(D)	(D)	265	(D)	(D)	961	1,267	6
Rubber products.....	30	(D)	(D)	(D)	455	(D)	(D)	390	0	(D)	390	(D)	669
Stone, clay, and glass products.....	32	(D)	(D)	(D)	706	(S)	(D)	51	(D)	(D)	163	(D)	242
Primary metals.....	33	714	8	706	(S)	0	(D)	(S)	(D)	(D)	(S)	(D)	323
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	225	(D)	(D)	0	(D)	(D)	(D)	(D)	105
Nonferrous metals and products.....	333-36	(D)	(D)	(D)	481	(D)	(D)	0	(D)	(D)	(S)	(D)	218
Fabricated metal products.....	34	974	226	748	53	0	53	(D)	(D)	(D)	156	(D)	539
Machinery.....	35	14,775	1,055	13,720	(D)	(D)	(D)	375	(D)	(D)	2,099	(D)	11,246
Office, computing, and accounting machines.....	357	(D)	(D)	(D)	10,419	(D)	(D)	220	(D)	(D)	1,319	(D)	8,880
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	(D)	3,301	(D)	(D)	155	818	(D)	780	(D)	2,366
Electrical equipment.....	36	13,415	4,550	8,865	(D)	(D)	(D)	276	(D)	(D)	2,618	8,886	2,916
Radio and TV receiving equipment.....	365	102	0	102	8	0	8	0	0	8	85	0	85
Communication equipment.....	366	3,465	288	(S)	(D)	(D)	(D)	60	(D)	(D)	879	(D)	2,244
Electronic components.....	367	361-64,369	(D)	2,403	(D)	(D)	(D)	118	841	(S)	791	(D)	2,268
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	90	(D)	(D)	90	(D)	(D)	940	(D)	1,373
Transportation equipment.....	37	27,428	12,570	14,858	723	511	212	2,876	1,228	1,648	23,829	(S)	12,998
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	9,063	(D)	(D)	511	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	262	(D)	(D)	601	5,533	11,450	16,983	16,983	14,635
Aircraft and missiles.....	372,376	(D)	(D)	(D)	5,533	11,450	16,983	601	1,747	817	930	(S)	4,513

See explanatory information and SOURCE at end of table.

Table A-26. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1991

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]													
Professional and scientific instruments.....	38	\$8,705	\$1,865	\$6,840	\$389	(D)	(D)	\$2,027	(D)	(D)	\$6,289	\$1,483	\$4,806
Scientific and mechanical measuring instruments.	381-82	(D)	(D)	3,017	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments.....	383-87	(D)	(D)	3,823	(D)	(D)	(D)	243	(D)	(D)	680	(D)	2,900
Other manufacturing industries.....	27,31,39	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	28,446	5,505	22,941	5,014	2,384	2,630	6,328	1,272	5,056	17,104	428	61
												1,849	367 15,255

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-27. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1992

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]													
Total.....		\$121,314	\$24,660	\$96,654	\$9,794	\$2,792	\$7,002	\$27,175	\$4,951	\$22,224	\$84,345	\$16,917	\$67,428
Food, kindred, and tobacco products.....	20-21	1,411	0	1,411	122	0	122	488	0	488	801	0	801
Textiles and apparel.....	22-23	277	(S)	259	(D)	(D)	(D)	33	(D)	38	198	10	188
Lumber, wood products, and furniture.....	24-25	(D)	(D)	(D)	(D)	(D)	(D)	70	0	70	(D)	(D)	(D)
Paper and allied products.....	26	(D)	(D)	1,191	(D)	0	(D)	(D)	(D)	536	(D)	0	(D)
Chemicals and allied products.....	28	16,711	(S)	16,420	2,054	16	2,038	5,583	77	5,506	9,073	196	8,876
Industrial chemicals.....	281-82,286	5,406	(S)	5,152	(D)	(D)	(D)	635	(D)	(D)	1,306	3,390	178
Drugs and medicines.....	283	8,831	(S)	8,822	1,235	3	(D)	1,232	(D)	(D)	3,342	(D)	4,248
Other chemicals.....	284-85,287-89	2,474	(S)	2,446	(D)	(D)	(D)	171	(D)	(D)	858	(D)	1,417
Petroleum refining and extraction.....	13,29	2,339	(D)	2,330	(D)	(D)	(D)	238	0	1,052	(D)	(D)	1,040
Rubber products.....	30	(D)	(D)	1,337	(S)	(D)	(D)	249	0	249	(D)	(D)	894
Stone, clay, and glass products.....	32	(D)	(D)	479	(D)	(D)	(D)	42	(D)	(D)	176	(D)	261
Primary metals.....	33	555	13	542	(D)	(D)	(D)	33	(D)	(D)	237	274	2
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	224	(D)	(D)	(D)	9	105	0	105	(D)	109
Nonferrous metals and products.....	333-36	(D)	(D)	318	24	24	24	142	(S)	132	(D)	(D)	1,623
Fabricated metal products.....	34	1,057	293	764	(D)	(D)	(D)	57	(D)	(D)	158	838	289
Machinery.....	35	15,135	1,062	14,073	(D)	(D)	(D)	744	(D)	(D)	1,782	12,152	606
Office, computing, and accounting machines.....	357	(D)	(D)	10,650	(D)	(D)	(D)	579	(D)	(D)	950	(D)	9,121
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	3,423	(D)	(D)	(D)	165	87	25	832	(D)	2,426
Electrical equipment.....	36	13,546	3,857	9,689	(D)	(D)	(D)	350	(D)	(D)	2,672	9,232	2,565
Radio and TV receiving equipment.....	365	(D)	(D)	93	(D)	0	(D)	(D)	(D)	(D)	731	76	75
Communication equipment.....	366	(D)	(D)	3,435	(D)	(D)	(D)	76	(D)	(D)	(D)	3,269	641
Electronic components.....	367	3,678	250	3,428	(D)	(D)	(D)	141	(D)	(D)	2,647	184	2,463
Other electrical equipment.....	361-64,369	(D)	(D)	2,733	(D)	(D)	(D)	(D)	(D)	(D)	1,091	3,240	1,739
Transportation equipment.....	37	26,484	10,758	15,726	595	422	173	2,489	1,083	1,406	23,398	9,251	14,147
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	94	0	94	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	21	0	21	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	16,119	9,871	6,248	480	422	58	1,775	1,040	1,040	13,863	8,409	5,455

See explanatory information and SOURCE at end of table.

Table A-27. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1992

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]													
Professional and scientific instruments.....	38	\$9,652	\$2,226	\$7,426	524	9	515	2,645	453	2,193	6,483	1,765	4,718
Scientific and mechanical measuring instruments.....	381-82	5,256	2,148	3,108	(D)	(D)	170	(D)	(D)	1,251	(D)	(D)	1,687
Optical, surgical, photographic, and other instruments.....	383-87	4,396	78	4,318	(D)	(D)	345	(D)	(D)	942	(D)	(D)	3,031
Other manufacturing industries.....	27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	30,103	5,892	(D) 24,211	4,489	2,304	80	155	60	95	5,565	2,109	407 16,461

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-28. Number of R&D-performing companies conducting basic research, by industry and size of company: 1992

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Industry	SIC code	Size of Company						R&D	Basic research	25,000 or more employees
		Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees			
Total.....	33,529	8,991	883	124	1,171	259	260	77	191	54
Food, kindred, and tobacco products.....	20,21	1,126	1,027	40	63	11	21	7	13	(D)
Textiles and apparel.....	22,23	79	30	(D)	13	(D)	(D)	(D)	(D)	0
Lumber, wood products, and furniture.....	24,25	356	125	(D)	33	(D)	0	6	9	(D)
Paper and allied products.....	26	48	54	(D)	28	6	(D)	10	10	6
Chemicals and allied products.....	28	1,110	61	12	74	30	18	10	24	(D)
Industrial chemicals.....	281-82,286	634	562	25	(D)	28	11	(D)	10	(D)
Drugs and medicines.....	283	368	284	8	(D)	17	7	(D)	(D)	(D)
Other chemicals.....	294-85,287-89	891	264	28	(D)	29	12	(D)	(D)	0
Petroleum refining.....	29	201	65	(D)	0	11	(D)	(D)	(D)	(D)
Rubber products.....	30	1,736	349	35	10	50	24	(D)	(D)	8
Stone, clay, and glass products.....	32	309	74	19	(D)	48	10	0	(D)	(D)
5 Primary metals.....	33	214	35	40	(D)	10	(D)	(D)	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	69	(D)	9	(D)	30	(D)	(D)	(D)	0
Nonferrous metals and products.....	333-36	145	(D)	31	(D)	18	(D)	(D)	(D)	(D)
Fabricated metal products.....	34	574	69	65	11	73	14	11	(D)	0
Machinery.....	35	4,600	1,180	116	14	135	18	19	(D)	8
Office, computing, and accounting machines.....	351-56,358-59	855	83	42	6	53	7	12	(D)	(D)
Other machinery, except electrical.....	357	3,745	1,097	74	8	82	11	7	(D)	(D)
Electrical equipment.....	36	2,785	561	86	11	124	22	14	(D)	10
Radio and TV receiving equipment.....	365	153	(D)	(D)	0	(D)	(D)	0	(D)	0
Communication equipment.....	366	430	(D)	(D)	47	7	0	0	(D)	(D)
Electronic components.....	367	1,399	232	29	(D)	47	9	7	(D)	(D)
Other electrical equipment.....	361-64,369	803	139	41	(D)	47	9	7	(D)	(D)
Transportation equipment.....	37	390	(D)	37	8	62	14	25	6	13
Motor vehicles and motor vehicles equipment.....	371	10	(D)	7	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	64	(D)	10	(D)	(D)	(D)	(D)	(D)	0
Aircraft and missiles.....	372,376	316	(D)	20	(D)	30	(D)	(D)	(D)	9

See explanatory information and SOURCE at end of table.

Table A-28. Number of R&D-performing companies conducting basic research, by industry and size of company: 1992

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Industry	SIC code	Size of Company									
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees	
		R&D	Basic research	R&D	Basic research	R&D	Basic research	R&D	Basic research	R&D	Basic research
Professional and scientific instruments.....	38	2,282	388	75	11	72	13	8	(D)	(D)	(D)
Scientific and mechanical measuring instruments.....	381-82	1,229	209	30	(D)	37	6	(D)	(D)	0	(D)
Optical, surgical, photographic, and other instruments.....	384-87	1,053	179	45	(D)	35	7	(D)	(D)	(D)	(D)
Other manufacturing industries.....	27,31,39	1,063	351	27	(D)	50	18	9	0	(D)	(D)
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	15,873	3,635	171	23	271	70	89	35	51	11
											40
											10

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-29. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1982-92 and projected 1993

Industry	SIC code	[Dollars in millions]									Projected 1993		
		1982	1983	1984	1985	1986	1987	1988	1989	1990			
Total.....		\$4,240	\$4,345	\$4,446	\$3,954	\$3,358	\$3,576	\$3,706	\$3,789	\$4,004	\$4,615	\$4,889	\$5,079
Food, kindred, and tobacco products 1/.....		20,21	(T)	(T)	(S)	2	2	(S)	2/	(D)	(D)	(D)	(D)
Textiles and apparel.....	22,23	5	5	5	5	1	1	(D)	(D)	(D)	(D)	0	(D)
Lumber, wood products, and furniture.....	24,25	3	3	3	6	(D)	(D)	(S)	1	(D)	(D)	(D)	(D)
Paper and allied products.....	26	28	347	345	191	162	(S)	(S)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products.....													
Industrial chemicals.....	281-82,286	338	335	181	(D)	(D)	(D)						
Drugs and medicines.....	283	(T)	(T)	(D)	(D)	2	2	(D)	(D)	(D)	(D)	(D)	(D)
Other chemicals.....	284-85,287-89												
Petroleum refining and extraction.....	13,29	1,162	1,284	1,356	1,199	999	914	1,056	1,128	1,177	1,416	1,401	1,395
Rubber products.....	30	14	17	16	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products.....	32	17	7	5	(S)	74	18	21	(D)	(D)	(D)	(D)	23
Primary metals.....	33	101	92	(S)					(D)	(D)	(D)	(D)	24
Ferrous metals and products.....	331-32,3398-99	22	35	35	26	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	79	57	(S)	(S)				(D)	(D)	(D)	(D)	(D)
Fabricated metal products.....													
Machinery.....	34	54	31	(D)	8	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
35	183	163	201	240	201	261	244	260	(D)	(D)	(D)	(D)	(S)
Office, computing, and accounting machines.....	351-56,358-59	16	(T)	(S)	12	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other machinery, except electrical.....	167	144	179	228	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electrical equipment.....													
Radio and TV receiving equipment.....	365	5	0	0	0	(D)	(D)	(D)	(D)	(D)	(D)	0	0
Communication equipment.....	366	155	150	(D)	115	(D)	(D)	(D)	(D)	(D)	(D)	(D)	6
Electronic components.....	367	40	82	(D)	618	(D)	(D)	(D)	(D)	(D)	(D)	(D)	7
Other electrical equipment.....	361-64,369	631	581	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Transportation equipment.....													
Motor vehicles and motor vehicles equipment.....	37	(T)	(T)	(D)	(S)	(S)	(S)	(D)	(D)	(D)	(D)	(D)	(S)
Other transportation equipment.....	371	(2)	(2)	(D)	(D)	1	(D)	(D)	(D)	(D)	(D)	(D)	0
Aircraft and missiles.....	373-75,379	2	2	425	661	681	537	754	(D)	(D)	(D)	(D)	(D)
372,376	363												

See explanatory information and SOURCE at end of table.

Table A-29. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1982-92 and projected 1993

Industry	SIC code	[Dollars in millions]						Projected 1993		
		1982	1983	1984	1985	1986	1987	1988	1989	1990
Professional and scientific instruments.....	38	\$54	\$45	\$36	(D)	(D)	\$7	\$16	\$11	(S)
Scientific and mechanical measuring instruments.....	381-82	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments.....	384-87	(T)	(T)	(D)	(D)	0	(D)	(D)	(D)	(D)
Other manufacturing industries 1/.....	27,31,39 07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	12 375 349 424 0 338 328 0 433 551 614	17 349 424 0 338 328 0 433 551 614	12 349 424 0 338 328 0 433 551 614	0 0 0 0 0 0 0 0 0 0 0	(D)	(D)	(D)	(D)	(D)
Nonmanufacturing industries.....										

1/ Until 1984, tobacco products (SIC 21) was included with "other manufacturing industries."

2) Less than \$0.5 million.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-30. Company and other (except Federal) funds for industrial energy R&D performance, by selected industry: 1982-92 and projected 1993

Industry	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993
[Dollars in millions]													
Total.....		\$2,762	\$2,842	\$2,962	\$2,537	\$2,167	\$2,410	\$2,317	\$2,418	\$2,558	\$2,691	\$2,812	\$2,883
Chemicals and allied products.....	28	178	166	169	145	(D)	(D)	911	(D)	(D)	1,124	1,174	(D)
Petroleum refining and extraction.....	13,29	1,096	1,218	(T)	(D)	957	1,050	1,229	246	220	1,394	1,409	1,387
Machinery.....	35	146	132	(D)	(D)	71	(D)	(D)	92	90	(S)	229	(S)
Electrical equipment.....	36	99	(T)	190	264	236	(D)	123	(D)	(D)	(D)	101	(D)
Aircraft and missiles.....	372,376	1,079	(T)	779	610	497	(D)	(D)	(D)	(D)	(D)	451	(D)
All other manufacturing industries.....	.....	143	189	84	170	195	248	173	(S)	(S)	311	274	(S)
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89												247

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld due to imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-31. Federal funds for industrial energy R&D performance, by selected industry: 1982-92 and projected 1993

Industry	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993
[Dollars in millions]													
Total.....		\$1,478	\$1,503	\$1,484	\$1,417	\$1,191	\$1,166	\$1,389	\$1,371	\$1,446	\$1,924	2,077	(S)
Chemicals and allied products.....	28	169	179	22	(D)	(D)	(D)	(D)	(D)	(D)	(D)	3	(D)
Petroleum refining and extraction.....	13,29	66	66	(T)	(D)	54	42	6	4	15	14	34	7
Machinery.....	35	(T)	(D)	(D)	(D)	681	629	(D)	(D)	(D)	(D)	(D)	(S)
Electrical equipment.....	36	685	681	681	629	662	302	302	417	5	1	0	(D)
Aircraft and missiles.....	372,376	264	83	83	211	206	235	235	52	263	356	367	2
All other manufacturing industries.....	.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89											1
Nonmanufacturing industries.....													514

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-32. Total (company, Federal, and other) funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

Primary energy source	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993	
												[Dollars in millions]	Page 1 of 1
Total.....	\$4,240			\$4,446	\$3,954	\$3,358	\$3,576	\$3,706	\$3,789	\$4,004	\$4,615	\$4,889	\$5,079
Fossil fuels.....	1,491	1,573	1,738	1,876	1,476	1,548	\$1,583	\$1,652	\$1,879	2,128	(S)	(S)	
Oil.....	N/A	905	N/A	1,395	N/A	(S)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gas.....	N/A	255	N/A	189	N/A	191	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Shale.....	N/A	48	N/A	125	N/A	11	N/A	77	N/A	N/A	N/A	N/A	N/A
Coal.....	N/A	(T)	N/A	150	N/A	46	N/A	(S)	N/A	N/A	N/A	N/A	N/A
Synthetic fossil fuels.....	N/A	(T)	(T)	N/A	111	N/A	23	N/A	17	N/A	(S)	N/A	N/A
Mining.....	N/A	N/A	N/A	N/A	8	N/A	3	N/A	(S)	N/A	N/A	N/A	N/A
Other.....	N/A	N/A	N/A	N/A	31	N/A	(S)	N/A	(S)	N/A	N/A	N/A	N/A
Other fossil fuels	N/A	(T)	N/A	17	N/A	51	N/A	(S)	N/A	58	N/A	N/A	N/A
Nuclear.....	1,078	1,118	1,113	1,212	979	926	1,098	919	973	1,139	1,191	1,191	1,359
Fission.....	N/A	973	N/A	1,062	N/A	859	N/A	856	N/A	1,134	N/A	N/A	N/A
Fusion.....	N/A	145	N/A	150	N/A	(S)	N/A	63	N/A	5			
Total geothermal, solar, and conservation and utilization.....	N/A	1,424	1,218	471	504	421	492	612	(D)	866	1,029	996	
Geothermal.....	N/A	(T)	N/A	54	N/A	48	N/A	(D)	N/A	(S)	N/A	N/A	
Solar.....	N/A	(T)	N/A	96	N/A	95	N/A	(D)	N/A	(S)	N/A	N/A	
Conservation and utilization.....	N/A	(T)	N/A	321	N/A	281	N/A	391	N/A	(S)	N/A	N/A	
All other energy.....	N/A	230	377	395	399	(S)	533	606	681	507	(S)	(S)	

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data are not separately available, but are included in total.

N/A = Not available

NOTES: Detailed data for 1983, 1985, 1987, and 1989 were estimated on the basis of (a), data actually reported in those years, (b) revised data for those years reported on the 1984, 1986, 1988 and 1990 survey forms, and (c) adjustments to new samples in 1987.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-33. Company and other (except Federal) funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

Primary energy source	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993	
												[Dollars in millions]	Page 1 of 1
Total.....	\$2,762	\$2,842	\$2,962	\$2,537	\$2,167	\$2,410	\$2,317	\$2,418	\$2,558	\$2,691	\$2,812	\$2,883	
Fossil fuels.....	1,361	1,455	1,509	1,797	(D)	(D)	1,519	1,485	1,704	1,869	1,918	1,953	
Oil.....	N/A	(T)	N/A	1,381	N/A	(S)	N/A	(S)	N/A	(S)	N/A	N/A	
Gas.....	N/A	(T)	N/A	(D)	N/A	(S)	N/A	(S)	N/A	(S)	N/A	N/A	
Shale.....	N/A	(T)	N/A	124	N/A	(S)	N/A	(S)	N/A	(S)	N/A	N/A	
Coal.....	N/A	(T)	N/A	(S)	N/A	29	N/A	(S)	N/A	(S)	N/A	N/A	
Synthetic fossil fuels.....	N/A	(T)	N/A	91	N/A	(S)	N/A	(D)	N/A	(S)	N/A	N/A	
Mining.....	N/A	(T)	N/A	8	N/A	(D)	N/A	(D)	N/A	(D)	N/A	N/A	
Other.....	N/A	(T)	N/A	(S)	N/A	(D)	N/A	(D)	N/A	(D)	N/A	N/A	
Other fossil fuels.....	N/A	(T)	N/A	17	N/A	(S)	N/A	(S)	N/A	(S)	N/A	N/A	
Nuclear.....	99	90	101	150	91	109	117	39	72	46	60	208	
Fission.....	N/A	71	N/A	135	N/A	82	N/A	27	N/A	45	N/A	N/A	
Fusion.....	N/A	19	N/A	15	N/A	(S)	N/A	12	N/A	1	N/A	N/A	
Total geothermal, solar, and conservation and utilization.....	1,147	1,086	1,086	313	(D)	(D)	314	416	278	478	571	531	
Geothermal.....	N/A	(T)	N/A	27	N/A	(D)	N/A	(D)	N/A	(S)	N/A	N/A	
Solar.....	N/A	(T)	N/A	51	N/A	41	N/A	(D)	N/A	(S)	N/A	N/A	
Conservation and utilization.....	N/A	(T)	N/A	235	N/A	(D)	N/A	384	N/A	(S)	N/A	N/A	
All other energy.....	N/A	150	267	277	(D)	(D)	367	478	504	298	263	196	

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

N/A = Not available

NOTES: Detailed data for 1983, 1985, 1987, 1989, and 1991 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1982, 1984, 1986, 1988, 1990, and 1992 survey forms and, (c) adjustments to new samples in 1981 and 1987.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-34. Federal funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

Primary energy source	[Dollars in millions]							Projected 1993
	1982	1983	1984	1985	1986	1987	1988	
Total.....	\$1,478	\$1,503	\$1,484	\$1,417	\$1,191	\$1,166	\$1,389	\$1,446
Fossil fuels.....	130	117	228	78	(D)	63	167	(D)
Oil.....	N/A	(T)	N/A	13	N/A	N/A	(S)	N/A
Gas.....	N/A	N/A	N/A	(D)	N/A	N/A	(S)	N/A
Shale.....	N/A	1	N/A	1	N/A	N/A	(S)	N/A
Coal.....	N/A	76	N/A	(S)	N/A	17	N/A	N/A
Synthetic fossil fuels.....	N/A	(T)	N/A	20	N/A	8	N/A	(S)
Mining.....	N/A	(T)	N/A	0	N/A	(D)	N/A	N/A
Other.....	N/A	(T)	N/A	(S)	N/A	(D)	N/A	N/A
Other fossil fuels.....	N/A	16	N/A	0	N/A	1	N/A	(S)
Nuclear.....	979	1,029	1,013	1,063	888	817	981	880
Fission.....	N/A	902	N/A	928	N/A	777	N/A	829
Fusion.....	N/A	127	N/A	135	N/A	(S)	N/A	51
Total geothermal, solar, and conservation and utilization.....	277	132	158	(D)	(D)	179	196	(D)
Geothermal.....	N/A	(T)	N/A	26	N/A	(D)	N/A	(S)
Solar.....	N/A	(T)	N/A	45	N/A	37	N/A	11
Conservation and utilization.....	N/A	80	N/A	87	N/A	(D)	N/A	38
All other energy.....	N/A	80	110	118	(D)	166	128	106
							177	(S)
							121	(S)

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

N/A = Not available

NOTES Detailed data for 1981, 1983, 1985, 1987, and 1989 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1980, 1982, 1984, 1986, 1988, and 1990 survey forms, and (c) adjustments to new samples in 1981 and 1987.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Research and Development: 1992

Table A-35. Number of companies performing energy R&D and total number of R&D-performing companies, by industry and size of company: 1992

Page 1 of 2

Industry	SIC code	Size of company									
		Fewer than 500 employees			500 to 999 employees			1,000 to 4,999 employees			5,000 to 9,999 employees
		Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy
Total.....	33,529	16	883	13	1,171	52	260	26	191	38	121
Food, kindred, and tobacco products.....	20,21	1,126	0	40	63	0	(D)	13	(D)	10	0
Textiles and apparel.....	22,23	79	0	30	55	0	(D)	9	(D)	0	0
Lumber, wood products, and furniture.....	24,25	356	0	0	33	0	(D)	6	(D)	0	0
Paper and allied products.....	26	48	0	54	28	0	(D)	10	(D)	6	(D)
Chemicals and allied products.....	28	1,893	(D)	61	(D)	74	(D)	18	(D)	24	(D)
Industrial chemicals.....	281-82,286	634	0	25	(D)	28	(D)	0	(D)	10	(D)
Drugs and medicines.....	283	368	0	8	0	17	0	(D)	(D)	(D)	(D)
Other chemicals.....	284-85,287-89	891	(D)	28	0	29	(D)	0	(D)	0	0
Petroleum refining.....	29	201	(D)	0	(D)	0	(D)	0	(D)	0	(D)
Rubber products.....	30	1,736	0	35	0	50	(D)	0	(D)	8	(D)
Stone, clay, and glass products.....	32	309	0	19	0	24	0	(D)	(D)	0	(D)
Primary metals.....	33	214	0	40	0	48	(D)	11	(D)	8	(D)
Ferrous metals and products.....	331-32,3398-99	69	0	9	0	30	(D)	7	(D)	0	(D)
Nonferrous metals and products.....	333-36	145	0	31	0	18	(D)	0	(D)	0	(D)
Fabricated metal products.....	34	574	(D)	65	0	73	(D)	11	(D)	12	(D)
Machinery.....	35	4,600	(D)	116	6	135	(D)	19	(D)	0	(D)
Office, computing, and accounting machines.....	357	855	(D)	42	(D)	53	(D)	12	(D)	0	(D)
Other machinery, except electrical.....	351-56,358-59	3,745	(D)	74	(D)	82	(D)	7	(D)	0	(D)
Electrical equipment.....	36	2,785	(D)	86	(D)	124	10	14	(D)	13	(D)
Radio and TV receiving equipment.....	365	153	0	(D)	0	(D)	0	0	(D)	0	(D)
Communication equipment.....	366	430	0	(D)	0	(D)	0	0	(D)	0	(D)
Electronic components.....	367	1,399	0	29	0	47	(D)	7	(D)	0	(D)
Other electrical equipment.....	361-64,369	803	(D)	41	(D)	47	(D)	7	(D)	0	(D)
Transportation equipment.....	37	390	0	37	0	62	(D)	25	(D)	12	(D)
Motor vehicles & motor vehicles equipment.....	373-75,379	10	0	7	0	(D)	(D)	0	(D)	13	(D)
Other transportation equipment.....	372,376	64	0	10	0	(D)	(D)	0	(D)	8	(D)
Aircraft and missiles.....	316	0	20	0	(D)	30	(D)	9	(D)	7	(D)

See explanatory information and SOURCE at end of table.

Table A-35. Number of companies performing energy R&D and total number of R&D-performing companies, by industry and size of company: 1992

Page 2 of 2

Industry	SIC code	Size of company						25,000 or more employees	
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees			
		Total	Energy	Total	Energy	Total	Energy		
Professional and scientific instruments.....	38	2,282	(D)	75	0	72	(D)	8 (D) 0 (D)	
Scientific and mechanical measuring instruments.....	381-82	1,229	(D)	30	0	37	(D)	(D) 0 (D)	
Optical, surgical, photographic, and other instruments.....	384-87	1,053	0	45	0	35	(D)	0 (D) 0 (D)	
Other manufacturing industries.....	27,31,39	1,063	0	27	0	50	(D)	9 0 (D) 0 (D)	
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	15,873	6	171	(D)	271	17	89 12 51 15 40 (D)	

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-36. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by industry: 1982-92 and projected 1993

Industry	SIC code	[Dollars in millions]						Page 1 of 2					
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993
Total.....	(S)	\$1,060	(S)	(S)	(S)	(S)	(S)	\$1,044	\$1,326	\$1,301	(S)	(S)	(S)
Food, kindred, and tobacco products 1/.....	20-21	\$1	\$9	\$12	\$1	\$1	\$1	\$1	\$1	\$1	\$4	\$5	(D)
Textiles and apparel.....	22-23	(T)	(T)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	2	2	(D)
Lumber, wood products, and furniture.....	24-25	3	2	1	1	1	1	2	3	2	(S)	(D)	1
Paper and allied products.....	26	9	6	7	8	7	7	7	19	18	13	13	(D)
Chemicals and allied products.....	28	191	167	158	(S)	168	117	136	178	163	188	140	140
Industrial chemicals.....	281-82-286	173	144	140	(S)	(D)	(D)	117	61	(D)	(S)	99	99
Drugs and medicines.....	283	6	11	8	(D)	(D)	(D)	(D)	(D)	(D)	16	18	18
Other chemicals.....	284-85-287-89	12	12	10	14	(D)	(D)	12	(D)	(D)	67	26	23
Petroleum refining and extraction.....	13-29	97	81	88	60	(D)	(D)	51	60	75	72	111	107
Rubber products.....	30	2	1	(D)	(D)	(D)	(D)	(D)	(D)	1	1	1	131
Stone, clay, and glass products.....	32	7	9	(S)	(S)	3	4	(D)	(D)	(D)	(D)	39	39
Primary metals.....	33	22	21	21	20	8	5	(D)	(D)	(D)	(D)	5	9
Ferrous metals and products.....	331-32-3398-99	13	10	13	11	2	(D)	(D)	(D)	(D)	(D)	4	(D)
Nonferrous metals and products.....	333-36	9	11	8	9	6	(D)	(D)	(D)	(D)	(D)	1	(D)
Fabricated metal products.....	34	11	7	14	6	(D)	(D)	(D)	(D)	(D)	1	2	5
Machinery.....	35	30	27	26	26	33	38	46	111	116	(S)	(S)	(S)
Office, computing, and accounting machines.....	357	0	0	(D)	0	0	0	0	0	0	(D)	0	0
Other machinery, except electrical.....	351-56-358-59	30	27	(D)	26	33	38	46	111	116	(D)	(S)	(S)
Electrical equipment.....	36	24	18	(D)	(D)	5	(D)	(D)	9	11	(D)	(D)	(D)
Radio and TV receiving equipment.....	365	0	0	(D)	0	0	(D)	(D)	0	0	0	0	0
Communication equipment.....	366	(T)	(T)	(T)	(S)	1	(D)	(D)	7	8	(D)	(D)	1
Electronic components.....	367	(T)	(T)	(T)	(D)	2	(D)	(D)	(D)	2	1	(D)	(D)
Other electrical equipment.....	361-64-369	(T)	(T)	(T)	(D)	(D)	(D)	(D)	(D)	1	(D)	(D)	(D)
Transportation equipment.....	37	(T)	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Motor vehicles & motor vehicles equipment.....	371	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75-379	0	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	120	195	121
Aircraft and missiles.....	372-376	372-376	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	114	138	138

See explanatory information and SOURCE at end of table.

Table A-36. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by industry: 1982-92 and projected 1993

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Industry	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993
[Dollars in millions]													
Professional and scientific instruments.....	38	(T)	\$3	\$2	\$2	(D)	(D)	\$3	(D)	\$4	\$10	\$6	\$8
Scientific and mechanical measuring instruments.....	381-82	(T)	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments.....	384-87	(T)	2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other manufacturing industries.....	27,31,39	(T)	2	3	(S)	0	(D)	(D)	(D)	1	(2)	(D)	(D)
Nonmanufacturing industries 3/.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	65	124	113	118	80	113	(S)	(S)	(S)	(S)	140	(S)

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Less than \$0.5 million.

3/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 80-87, and 87.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-37. Company and other (except Federal) funds for industrial pollution-abatement R&D performance, by selected industry: 1982-92 and projected 1993

Industry	SIC code	[Dollars in millions]									Projected 1993
		1982	1983	1984	1985	1986	1987	1988	1989	1990	
Total.....											
Chemicals and allied products.....	28	123	101	(S)	(S)	(S)	(S)	(S)	(S)	\$955	(S)
Petroleum refining and extraction.....	13,29	97	82	(D)	(D)	(D)	(D)	(D)	(D)	163	(S)
Machinery.....	35	(T)	12	(D)	(D)	(D)	(D)	(D)	(D)	60	(D)
Electrical equipment.....	36	12	13	(D)	(D)	(D)	(D)	(D)	(D)	46	(S)
Aircraft and missiles.....	372,376	22	17	(D)	(D)	(D)	(D)	(D)	(D)	38	(D)
All other manufacturing industries.....	.....	(T)	24	(D)	(D)	(D)	(D)	(D)	(D)	62	(D)
Nonmanufacturing industries 1/.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	38	51	(D)	(D)	(D)	(D)	(D)	(D)	676	(D)
										70	(D)
										737	(D)
										58	(D)

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 80-81, and 87.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-38. Federal funds for industrial pollution-abatement R&D performance, by selected industry: 1982-92 and projected 1993

Industry	SIC code	[Dollars in millions]							Projected 1993
		1982	1983	1984	1985	1986	1987	1988	
Total.....		\$122	\$176	\$169	\$148	\$186	\$191	\$89	\$97
Chemicals and allied products.....	28	68	(D)	(D)	(D)	(D)	(D)	0	\$122
Petroleum refining and extraction.....	13.29	0	(T)	(D)	(D)	(D)	(D)	0	0
Machinery.....	35	(T)	(D)	(D)	(D)	(D)	(D)	0	0
Electrical equipment.....	36	12	(T)	(D)	(D)	(D)	(D)	0	(D)
Aircraft and missiles.....	372,376	(T)	(T)	(D)	(D)	(D)	(D)	0	(D)
All other manufacturing industries.....	07-10, 12-17,	26	(T)	(D)	(D)	(D)	(D)	0	(D)
Nonmanufacturing industries 1/.....	40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	74	67						

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 80-07, and 87.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

**Table A-39. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies,
by industry and size of company: 1983-93**

Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
[In thousands]												
Total (January) Total (Annual average)		540.9 562.5	584.1 603.3	622.5 646.8	671.0 683.4	695.8 702.2	708.6 715.6	722.5 733.0	743.6 758.5	773.4 776.4	779.3 783.8	787.1 N/A
Distribution by industry:												
Food, kindred, and tobacco products 11.....	20,21	7.7	7.4	(S) 2.3	(S) 1.8	(S) 6.6	(S) 6.4	(S) 1.3	(S) 1.3	(S) 2.4	9.4 (S) 2.8	9.8 2.8
Textiles and apparel.....	22,23	2.2	2.3	(T) 1.8	(S) 1.8	(S) 6.6	(S) 7.1	(S) 6.0	(S) 6.1	(S) 1.4	(S) 1.4	9.9 3.1
Lumber, wood products, and furniture.....	24,25	7.6	7.6	(T) 6.6	(T) 6.6	(T) 7.1	(T) 7.5	(T) 7.5	(T) 7.5	(T) 6.4	(T) 8.5	1.7 10.7
Paper and allied products.....	26	67.3	69.8	71.1	75.8	75.2	78.3	80.4	81.6	81.6	85.6	89.2
Chemicals and allied products.....	28											
Industrial chemicals.....	281-82,286	26.6	25.6	23.5	24.9	(S) 30.8	(S) 31.8	(S) 32.6	(S) 33.0	(S) 34.4	(S) 35.4	29.6 42.6
Drugs and medicines.....	283	28.2	28.2	16.7	19.1	20.2	20.3	18.8	18.9	17.0	17.0	17.0
Other chemicals.....	284-85,287-89	12.1	13.4									
Petroleum refining and extraction.....	13,29	14.7	13.3	13.5	10.4	9.9	9.5	10.7	11.1	11.4	11.5	11.5
Rubber products.....	30	(T) 5.5	(T) 5.6	(S) 6.6	(S) 7.5	(S) 8.6	(S) 8.6	(S) 7.6	(S) 7.0	(S) 6.0	(S) 14.8	14.9
Stone, clay, and glass products.....	32	8.3	8.4	7.1	5.7	5.5	5.6	5.5	5.5	5.2	4.6	5.3
Primary metals.....	33											4.9
Ferrous metals and products.....	331-32,3398-99	5.2	5.3	4.2	2.5	(S) 3.2	(S) 3.4	(S) 3.3	(S) 3.3	(S) 3.3	(S) 3.0	1.7 (S)
Nonferrous metals and products.....	333-36	3.0	3.1	2.9								
Fabricated metal products.....	34	(T) 79.6	(T) 87.0	(S) 16.6	(S) 89.7	(S) 89.7	(S) 9.9	(S) 10.5	(S) 9.9	(S) 10.1	(S) 10.1	8.2 99.4
Machinery.....	35											
Office, computing, and accounting machines.....	357	52.6	56.5	61.8	71.9	73.4	74.4	75.0	84.7	84.7	77.6	66.6
Other machinery, except electrical.....	351-56,358-59	27.0	30.5	19.9	17.8	22.4	24.0	25.4	28.6	32.1	32.2	32.8
Electrical equipment.....	36	108.6	113.2	113.2	117.9	130.4	132.5	122.5	105.2	95.9	91.9	90.5
Radio and TV receiving equipment.....	365	(T) 59.3	(T) 62.2	(S) 1.8	(S) 1.2	(S) 1.3	(S) 1.3	(S) 1.5	(S) 0.8	(S) 1.0	(S) 1.0	1.0
Communication equipment.....	366	48.8	25.6	(T) 18.4	(T) 17.9	(T) 16.5	(T) 13.6	(T) 13.6	(S) 43.7	(S) 44.3	(S) 47.1	31.2 29.5
Electronic components.....	367											
Other electrical equipment.....	361-64,369	(T) 111.5	(T) 130.2	(S) 144.8	(S) 136.3	(S) 136.4	(S) 134.8	(S) 134.8	(S) 115.3	(S) 100.2	(S) 92.9	(S) 95.0

See explanatory information and SOURCE at end of table.

**Table A-39. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies,
by industry and size of company: 1983-93**

Industry and size of company	SIC code	[In thousands]							Page 2 of 2		
		1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Distribution by industry:											
Professional and scientific instruments.....	38	(T)	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Scientific and mechanical measuring instruments.	381-82	(T)	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Optical, surgical, photographic, and other instruments.....	384-87	(T)	(T)	19.8	24.0	24.6	24.9	14.5	8.1	(S)	(S)
Other manufacturing industries 1/.....	27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	5.9	(T)	(S)	(S)	6.3	6.4	5.4	5.6	(S)	6.0
Nonmanufacturing industries.....	.....	31.2	49.8	66.8	75.1	96.4	101.9	125.2	(S)	(S)	202.6
Distribution by size of company [Based on number of employees]											
Total (January).....	540.9	584.1	622.5	671.0	695.8	708.6	722.5	743.6	773.4	779.3	787.1
Fewer than 500 2/.....	52.7	81.9	78.3	(S)	105.2	109.0	105.4	(S)	142.1	140.3	.....
500 to 999 3/.....	N/A	N/A	16.5	(S)	18.4	19.3	18.0	18.6	46.2	48.5	.....
1,000 to 4,999.....	48.3	52.6	61.6	66.7	76.4	81.9	76.1	75.4	94.2	102.6	.....
5,000 to 9,999.....	29.8	30.1	28.5	38.9	40.5	47.3	57.2	55.1	57.6	58.7	.....
10,000 to 24,999.....	84.3	84.0	89.9	88.4	92.0	94.5	87.0	73.9	90.3	99.9	103.8
25,000 or more.....	325.8	335.5	347.6	365.3	363.3	363.7	388.7	404.2	408.4	339.3	333.2

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY:
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data not separately available, but are included in total.
 N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-40. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total.....												
Distribution by industry												
Food, kindred, and tobacco products 1/.....	20,21	\$111,600	\$116,000	\$124,000	\$130,200	\$128,500	\$128,800	\$132,300	\$134,500	\$141,300	\$148,600	\$154,900
Textiles and apparel.....	22,23	(D)	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)	(D)	143,500
Lumber, wood products, and furniture.....	24,25	(S)	(S)	(S)	115,400	116,300	(S)	(S)	(D)	(D)	(D)	94,100
Paper and allied products.....	26	70,800	(D)	(D)	(D)	116,300	117,100	125,000	(D)	(D)	(D)	137,300
Chemicals and allied products.....	28	102,500	104,800	112,500	(D)	(D)	139,400	149,000	159,000	(D)	(D)	116,100
Industrial chemicals.....	281-82,286	122,100	123,100	132,000	144,600	150,200	(S)	(S)	(S)	(S)	(S)	191,300
Drugs and medicines.....	283	(D)	(D)	103,100	(D)	(D)	(D)	(D)	(D)	(D)	(D)	181,600
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	(D)	83,100	(D)	(D)	(D)	(D)	(D)	217,400
Petroleum refining and extraction.....	13,29	(D)	(D)	(D)	(D)	(D)	187,400	182,700	194,000	201,800	217,000	203,300
Rubber products.....	30	(D)	(D)	75,400	(D)	(D)	(D)	(D)	(D)	(D)	(D)	89,800
Stone, clay, and glass products.....	32	(D)	(D)	(D)	(D)	118,000	122,500	131,500	118,600	(S)	(D)	111,100
Primary metals.....	33	118,200	129,900	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	142,200
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	136,400	138,800	(D)	(D)	(D)	(D)	136,400
Nonferrous metals and products.....	333-36	(D)	(D)	(D)	(D)	112,000	(D)	(D)	(D)	(D)	(D)	(S)
Fabricated metal products.....	34	(S)	(S)	111,600	112,900	(S)	76,600	88,100	(S)	(S)	(S)	125,400
Machinery.....	35	103,800	108,400	124,500	142,500	(D)	(D)	(D)	(D)	(D)	(D)	152,300
Office, computing, and accounting machines.....	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	172,900
Other machinery, except electrical.....	351-56,3568-59	(D)	(D)	(D)	(D)	119,200	98,300	(D)	(D)	(D)	(D)	110,300
Electrical equipment.....	36	100,000	114,300	121,700	124,900	120,700	124,300	124,100	132,400	142,800	147,100	148,600
Radio and TV receiving equipment.....	365	(D)	105,300	(D)	(D)	88,700	97,900	(D)	(D)	(D)	(D)	94,400
Communication equipment.....	366	123,300	135,000	143,000	141,300	114,100	147,800	155,300	160,300	170,600	177,100	(S)
Electronic components.....	367	69,600	(D)	(S)	100,500	(D)	(D)	(D)	98,400	(D)	(D)	126,900
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	(D)	(D)	170,700	183,400	195,600	211,700	215,700	158,600
Transportation equipment.....	37	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	185,300
Motor vehicles and motor vehicles equipment.....	371	162,600	184,700	211,400	223,100	(D)	(D)	(D)	(D)	(D)	(D)	222,400
Other transportation equipment.....	373-75,379	114,200	116,000	143,600	161,700	149,800	180,400	193,300	207,300	213,700	(D)	(S)
Aircraft and missiles.....	372,376	148,800										171,600

See explanatory information and SOURCE at end of table.

Table A-40. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1982-92

Distribution by industry	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Professional and scientific instruments.....	38	(S)	\$116,900	\$122,000	(S)							
Scientific and mechanical measuring instruments.....	381-82	(D)	83,200	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)
Optical, surgical, photographic, and other instruments.....	384-87	(D)	141,100	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)
Other manufacturing industries 1/.....	27,31,39	(D)	98,500	(D)	94,600	(D)	86,800	69,100	(D)	(D)	(D)	137,400
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	84,800	82,400	84,100	94,600	86,800	74,900					109,900 145,600
Distribution by size of company [Based on number of employees]												
Fewer than 500 2/.....	62,800	65,700	55,000	(S)	70,600	66,800	67,100	66,200	(S)	103,400	102,600	
500 to 999 3/.....	N/A	N/A	87,200	(S)	103,400	92,600	98,200	98,200	(S)	178,700	176,100	
1,000 to 4,999.....	84,800	82,800	96,700	97,300	106,400	91,900	101,900	91,400	119,400	125,600		
5,000 to 9,999.....	82,900	93,400	111,000	119,300	108,400	102,900	100,400	102,500	110,800	150,800	148,400	
10,000 to 24,989.....	98,500	112,900	130,500	124,600	122,300	132,700	143,000	127,300	135,300	167,300	163,800	
25,000 or more.....	128,900	134,200	143,000	155,300	154,300	157,700	160,700	168,200	193,700	180,100	181,000	

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."
 2/ Data for 1982-83 are for companies with fewer than 1,000 employees.
 3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available

NOTE S: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-41. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1992

Industry	SIC code	Total	Size of company				
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees
Total.....		\$154,899	\$102,615	\$176,098	\$125,603	\$148,392	\$163,762
Food, kindred, and tobacco products.....	20,21	143,535	159,690	77,932	107,041	(S)	180,953
Textiles and apparel.....	22,23	94,114	125,877	95,336	90,503	(D)	199,226
Lumber, wood products, and furniture.....	24,25	137,328	98,809	98,544	177,432	(D)	(D)
Paper and allied products.....	26	116,145	140,594	84,390	111,379	131,225	111,715
Chemicals and allied products.....	28	191,251	95,950	164,284	194,839	165,596	246,979
Industrial chemicals.....		181,576	56,838	(D)	156,021	152,892	(S)
Drugs and medicines.....	281-82,286	217,360	167,249	(D)	200,252	208,510	(D)
Other chemicals.....	283	145,730	80,318	(D)	103,180	138,391	(D)
Petroleum refining and extraction.....	284-85,287-89	13,29	203,284	106,489	(D)	144,652	(D)
Rubber products.....	30	89,793	44,968	(D)	195,667	(S)	216,779
Stone, clay, and glass products.....	32	111,100	57,574	(S)	83,887	(D)	(D)
Primary metals.....	33	110,557	92,801	(S)	104,937	114,194	(D)
Ferrous metals and products.....	331-32,3398-99	136,413	94,436	88,621	89,062	160,589	(D)
Nonferrous metals and products.....	333-36	(S)	91,680	(S)	117,170	(S)	(D)
Fabricated metal products.....	34	125,367	158,884	98,296	89,318	140,838	(S)
Machinery.....	35	152,320	84,566	112,921	112,688	172,453	163,428
Office, computing, and accounting machines.....	357	172,895	113,074	124,089	129,574	180,163	184,977
Other machinery, except electrical.....	351-56,358-59	110,284	77,037	100,818	99,073	(D)	172,216
Electrical equipment.....	36	148,572	93,563	109,733	119,966	134,964	156,623
Radio and TV receiving equipment.....	365	94,443	60,208	(D)	125,375	0	(D)
Communication equipment.....	366	(S)	105,572	87,274	109,318	0	(D)
Electronic components.....	367	126,923	97,314	132,156	132,376	146,248	(D)
Other electrical equipment.....	361-64,369	158,575	76,704	(D)	112,697	(S)	(D)
Transportation equipment.....	37	185,306	68,176	139,098	111,569	110,154	154,904
Motor vehicles and motor vehicles equipment.....	371	222,408	57,002	92,270	105,617	(D)	(D)
Other transportation equipment.....	373-75,379	(S)	63,905	205,448	83,345	(D)	(D)
Aircraft and missiles.....	372,376	171,587	62,427	151,884	116,070	87,391	175,214

See explanatory information and SOURCE at end of table.

Table A-41. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1992

Industry	SIC code	Total	Size of company			
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees
Professional and scientific instruments.....	38	(S)	\$69,707	\$147,326	\$112,760	(S)
Scientific and mechanical measuring instruments.....	381-82	(S)	82,049	132,712	106,259	(D)
Optical, surgical, photographic, and other instruments.....	384-87	(S)		(S)	163,919	(D)
Other manufacturing industries.....	07,31,39	109,891	123,295	95,309	111,047	(D)
Nonmanufacturing industries.....	40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	145,553	124,109	203,907	111,734	145,978
						123,118

KEY:
(D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-42. Cost per R&D scientist or engineer in R&D-performing companies ranked by size of R&D program: 1982-92

Companies ranked by size of R&D program (based on total R&D funds)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
First 4.....	\$182,800	\$185,200	\$202,000	\$225,800	\$225,900	\$222,600	\$226,200	\$218,100	\$219,800	\$213,200	\$209,800
Next 4.....	127,600	154,000	167,000	176,200	171,400	196,900	210,700	225,800	249,000	223,700	221,000
Next 12.....	127,500	119,300	127,800	132,500	131,200	141,600	153,000	148,700	129,100	159,900	171,600
Next 20.....	104,200	117,800	121,000	144,000	125,600	146,300	154,500	132,500	145,800	(S)	(S)
Next 60.....	98,000	118,800	130,400	124,100	139,000	128,700	141,300	145,400	164,200	170,500	179,800
Next 100.....	99,200	96,300	108,900	122,800	146,700	128,600	137,300	141,900	137,000	169,000	173,900
Next 200.....	86,900	86,400	97,300	94,100	138,000	110,800	124,500	106,100	120,200	121,000	136,000
Average of above 400 R&D performing companies.....	118,500	125,400	139,000	144,400	160,400	153,100	160,600	161,500	161,200	169,000	175,700

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-43. Domestic employment of R&D-performing companies, by industry and size of company: 1991-92

Page 1 of 3

Industry	SIC code	Total	Size of company				
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees
[in thousands]							
Total.....		16,963	1,938	572	2,440	1,725	2,970
Food, kindred, and tobacco products.....	20,21	1,023	43	27	149	139	188
Textiles and apparel.....	22,23	408	19	21	108	47	(D)
Lumber, wood products, and furniture.....	24,25	264	42	14	70	41	(D)
Paper and allied products.....	26	577	15	34	58	58	172
Chemicals and allied products.....	28	1,203	145	41	186	128	406
Industrial chemicals.....	281-82,286	491	14	18	69	57	164
Drugs and medicines.....	283	391	82	(D)	56	22	169
Other chemicals.....	284-85,287-89	321	49	(D)	61	49	(D)
Petroleum refining and extraction.....	13,29	441	13	3	26	22	72
Rubber products.....	30	388	117	(D)	110	26	78
Stone, clay, and glass products.....	32	234	25	(D)	41	29	95
Primary metals.....	33	451	38	(D)	101	81	124
Ferrous metals and products.....	331-32,3398-99	235	14	(D)	68	49	52
Nonferrous metals and products.....	333-36	216	24	(D)	33	32	72
Fabricated metal products.....	34	486	70	41	142	64	169
Machinery.....	35	1,417	263	79	272	145	142
Office, computing, and accounting machines.....	357	526	14	(D)	48	79	(D)
Other machinery, except electrical.....	351-56,358-59	891	249	(D)	224	65	162
Electrical equipment.....	36	1,393	183	57	235	93	213
Radio and TV receiving equipment.....	365	34	7	(D)	7	0	(D)
Communication equipment.....	366	369	36	(D)	42	0	(D)
Electronic components.....	367	321	84	21	95	49	(D)
Other electrical equipment.....	361-64,359	669	56	26	91	44	113
Transportation equipment.....	37	1,996	24	22	86	147	201
Motor vehicles and motor vehicles equipment.....	371	913	4	5	48	(D)	(D)
Other transportation equipment.....	373-75,379	95	7	6	6	(D)	(D)
Aircraft and missiles.....	372,376	988	13	11	32	37	762

See explanatory information and SOURCE at end of table.

Table A-43. Domestic employment of R&D-performing companies, by industry and size of company: 1991-92

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Industry	SIC code	Total	Size of company				
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees
[in thousands]							
Professional and scientific instruments.....	38	895	117	46	148	54	45
Scientific and mechanical measuring instruments.....	381-82	547	63	(D)	83	29	(D)
Optical, surgical, photographic, and other instruments.....	384-87	348	54	(D)	65	25	(D)
Other manufacturing industries.....	27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	412 5,375	97 727	18 105	99 609	51 600	76 842
1991							
Total.....	16,632	1,855	585	2,463	1,742	2,923	7,064
Food, kindred, and tobacco products.....	20,21 22,23 24,25	1,023 411 273	54 17 43	28 22 15	152 114 76	137 45 57	187 (D) (D)
Textiles and apparel.....						42	235
Lumber, wood products, and furniture.....	26	571	14	35	61	169	(D)
Paper and allied products.....	28	1,150	136	42	170	127	399
Chemicals and allied products.....							276
Industrial chemicals.....	281-82,286	454	15	17	67	54	152
Drugs and medicines.....	283	376	69	(D)	41	24	181
Other chemicals.....	284-85,287-89	320	52	(D)	62	49	(D)
Petroleum refining and extraction.....	13,29	406	12	3	24	22	71
Rubber products.....	30	393	116	(D)	112	27	39
Stone, clay, and glass products.....	32	232	25	(D)	42	29	93
Primary metals.....	33	447	36	(D)	106	83	117
Ferrous metals and products.....	331-32,3398-99	232 333-36	12 24	(D)	69 37	52 31	47 70
Nonferrous metals and products.....							(D)

See explanatory information and SOURCE at end of table.

Table A-43. Domestic employment of R&D-performing companies, by industry and size of company: 1991-92

Page 3 of 3

Industry	SIC code	Total	Size of company						
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees		
[in thousands]									
1992									
Fabricated metal products.....	34	500	84	42	139	63	172		
Machinery.....	35	1,347	247	77	268	141	145		
Office, computing, and accounting machines.....	357	479	14	(D)	48	76	(D)		
Other machinery, except electrical.....	368	868	233	(D)	220	65	(D)		
Electrical equipment.....	36	1,382	185	59	234	96	214		
Radio and TV receiving equipment.....	365	36	7	(D)	8	0	(D)		
Communication equipment.....	366	366	37	(D)	43	0	(D)		
Electronic components.....	367	317	84	21	91	49	(D)		
Other electrical equipment.....	361-64,369	663	57	27	92	47	117		
Transportation equipment.....	37	1,902	20	22	86	149	186		
Motor vehicles and motor vehicles equipment.....	371	911	2	5	52	(D)	(D)		
Other transportation equipment.....	373-75,379	96	6	8	6	(D)	(D)		
Aircraft and missiles.....	372,376	895	12	9	28	37	119		
Professional and scientific instruments.....	38	879	134	50	148	54	43		
Scientific and mechanical measuring instruments.....	381-82	525	75	(D)	81	26	(D)		
Optical, surgical, photographic, and other instruments.....	384-87	354	59	(D)	67	28	(D)		
Other manufacturing industries.....	27,311-39	411	88	19	96	58	69		
Nonmanufacturing industries.....	07-10,12-17, 50-59,60-65,67, .701-.73,.75-76, .78-79,.80-81, .83-84,.87,.89	5,305	644	108	639	833	2,473		

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development, 1992

Table A-44. R&D scientists and engineers per 1,000 employees in manufacturing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Distribution by industry												
Total.....		33	34	40	43	45	46	46	47	50	50	47
Food, kindred, and tobacco products 1/.....		20,21	6	7	8	7	7	8	8	9	9	10
Textiles and apparel.....	(S)	22,23	4	5	5	4	4	(S)	6	7	7	7
Lumber, wood products, and furniture.....	(S)	24,25	(S)	6	6	5	5	5	6	5	6	6
Paper and allied products.....	14	26	12	13	13	11	11	13	16	17	19	19
Chemicals and allied products.....	51	28	54	57	57	70	68	69	69	69	76	76
Industrial chemicals.....	44	45	41	39	56	52	54	56	59	60	66	66
Drugs and medicines.....	74	74	(S)	89	81	98	94	92	96	95	108	108
Other chemicals.....	37	39	51	62	63	61	60	60	53	53	53	53
Petroleum refining and extraction.....	13,29	22	22	21	19	20	24	26	26	26	28	28
Rubber products.....	30	(S)	(S)	27	26	25	19	(S)	26	32	38	38
Stone, clay, and glass products.....	15	32	16	17	20	20	24	26	26	24	24	23
Primary metals.....	33	10	11	12	12	11	12	12	12	11	11	11
Ferrous metals and products.....	8	11	11	11	7	9	9	8	7	7	7	7
Nonferrous metals and products.....	13	13	16	16	17	16	17	16	15	(S)	(S)	(S)
Fabricated metal products.....	34	(S)	(S)	(S)	(S)	(S)	17	17	(S)	20	19	17
Machinery.....	35	48	57	56	60	64	67	66	71	73	74	74
Office, computing, and accounting machines.....	357	80	88	90	99	107	115	114	126	131	137	139
Other machinery, except electrical.....	351-56,358-59	26	30	32	29	26	29	29	31	33	36	38
Electrical equipment.....	36	55	51	49	53	59	65	71	68	66	67	66
Radio and TV receiving equipment.....	365	(S)	(S)	(S)	23	55	45	45	44	30	30	28
Communication equipment.....	366	74	61	56	62	68	73	94	96	89	91	85
Electronic components.....	367	66	(S)	(S)	81	82	86	100	96	89	95	91
Other electrical equipment.....	361-64,369	(S)	30	30	26	28	26	30	30	38	43	45
Transportation equipment.....	37	N/A	(S)	71	69	68	72	71	68	73	73	75
Motor vehicles and motor vehicles equipment.....	371	31	30	27	28	38	42	41	43	49	49	49
Other transportation equipment.....	373-75,379	12	(S)	8	23	38	40	52	45	(S)	(S)	(S)
Aircraft and missiles.....	372,376	94	102	110	116	91	103	101	96	98	105	105

See explanatory information and SOURCE at end of table.

Table A-44. R&D scientists and engineers per 1,000 employees in manufacturing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Distribution by industry												
Professional and scientific instruments.....	38	(S)	(S)	(S)	(S)	(S)	(S)	71	62	59	71	(S)
Scientific and mechanical measuring instruments.....	381-82	(S)	(S)	(S)	(S)	(S)	(S)	85	84	96	95	(S)
Optical, surgical, photographic, and other instruments.....	383-87	(S)	(S)	(S)	(S)	(S)	(S)	70	61	63	48	28
Other manufacturing industries 1/.....	27,31,39	9	(S)	(S)	(S)	(S)	(S)	18	17	14	14	14
Distribution by size of company [Based on number of employees]												
Less than 500 2/.....	30	34	42	50	59	59	50	50	50	51	56	61
500 to 999 3/.....	N/A	N/A	21	21	23	27	29	29	28	32	32	37
1,000 to 4,999.....	22	25	24	26	32	30	26	29	29	32	34	40
5,000 to 9,999.....	23	22	19	19	28	29	33	33	35	37	38	38
10,000 to 24,999.....	26	26	29	30	33	32	33	35	35	36	41	41
25,000 or more.....	43	42	47	49	56	57	59	61	61	66	66	62

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.
N/A = Not available

NOTES: The number of R&D scientists and engineers per 1,000 employees for 1992 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1991 and January 1992 by the number of employees in all activities in March 1991. Similar procedures were used for earlier years. Nonmanufacturing industries are included in pre-1983 calculations.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-45. R&D funds per employee in R&D-performing companies, by size of company: 1982-92

Page 1 of 1

Size of company [based on the number of employees]	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total (company, Federal, and other) R&D funds per employee											
Total.....	\$3,719	\$4,163	\$4,579	\$5,148	\$5,153	\$5,338	\$5,594	\$5,920	\$6,291	\$6,842	\$7,268
Fewer than 500 1/.....	1,732	2,186	2,767	3,028	5,414	5,553	5,377	5,660	6,339	7,279	7,688
500 to 999 2/.....	N/A	N/A	2158	2,238	3,229	3,121	2,906	3,197	3,826	(W)	(W)
1,000 to 4,999.....	1,790	2,042	2,480	2,725	3,261	3,395	3,223	3,404	3,738	4,243	5,025
5,000 to 9,999.....	1,883	2,194	2,505	2,851	2,849	3,210	3,992	4,158	4,456	4,706	4,948
10,000 to 24,999.....	2,469	2,966	3,385	3,500	3,334	3,668	3,713	3,607	4,401	5,223	5,619
25,000 or more.....	5,502	5,785	6,184	7,071	6,878	7,035	7,388	7,863	8,005	8,252	8,619
Company and other (except Federal) R&D funds per employee											
Total.....	\$2,534	\$2,814	\$3,095	\$3,383	\$3,503	\$3,562	\$3,844	\$3,607	\$4,401	\$5,322	\$5,791
Fewer than 500 1/.....	1,381	1,749	2,212	2,407	4,750	4,811	4,782	5,201	5,701	6,242	6,553
500 to 999 2/.....	N/A	N/A	1,782	1,700	2,997	2,859	2,677	3,029	3,598	(W)	(W)
1,000 to 4,999.....	1,503	1,687	2,096	2,316	2,725	2,799	2,761	2,990	3,346	3,817	4,561
5,000 to 9,999.....	1,551	1,613	2,199	2,409	2,316	2,682	3,335	3,624	4,286	4,228	4,463
10,000 to 24,999.....	2,025	2,351	2,689	2,769	2,697	2,969	3,163	3,217	3,863	4,106	4,435
25,000 or more.....	3,436	3,637	3,792	4,208	4,077	4,010	4,402	5,016	5,251	5,739	6,228

1/ Data for 1982-83 are for companies with fewer than 1,000 employees.

2/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: N/A = Not available

(W) = Data have been withheld pending further review.

NOTES: Averages were derived by dividing total and company R&D funds for a calendar year by employment data for March of that year.

As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table A-46. Concentration of total employment in R&D-performing companies ranked by size of R&D program: 1986-92

[Percent]

Page 1 of 1

Companies	1986	1987	1988	1989	1990	1991	1992
First 4 (1-4).....	7	7	7	7	7	7	6
Next 4 (5-8).....	4	4	3	3	3	3	3
Next 12 (9-20).....	5	6	6	6	5	5	5
Next 20 (21-40).....	6	6	5	4	5	4	4
Next 60 (41-100).....	9	8	9	10	9	9	8
Next 100 (101-200).....	7	7	8	8	8	10	10
Next 200 (201-400).....	10	9	9	9	11	10	10
All others.....	52	53	53	53	52	52	54

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

SECTION B. TECHNICAL NOTES

INTRODUCTION

This report is the third of three publications produced from the 1992 Survey of Industrial Research and Development. The first, a Data Brief announcing the availability of survey results, contains some analytical information and describes recent changes to the survey that are discussed in detail below. The second, a Selected Data report, contains 16 of the most frequently requested tabulations and was published while this more comprehensive report was being prepared. This report, the Detailed Statistical Tables report, contains the full set of statistics produced from the survey. All three of the publications provide statistics on research and development (R&D) funding for the years 1982-92 and on R&D personnel for the period from January 1983 to January 1994.

This report provides national estimates of the expenditures on R&D performed within the United States by industrial firms, whether U.S. or foreign owned. Among the statistics, classified various ways, are estimates of total R&D, the portion of the total financed by U.S. Government funds, and the portion financed by the companies themselves (or by other non-Federal sources such as State and local governments or other industrial firms under contracts or subcontracts). Total R&D is also separated into its character-of-work components: basic research, applied research, and development. Other R&D statistics include those on the funds for R&D financed by the domestic firm but performed outside the United States and on the funds spent to perform energy-related R&D. Also in this report are statistics on R&D-performing companies including domestic net sales, number of employees, number of R&D-performing scientists and engineers, and cost per R&D scientist and engineer.

The Survey of Industrial Research and Development is a sample survey that intends to include or represent all for-profit, nonfarm R&D-performing companies, either publicly or privately held. The survey's primary focus is on U.S. industry as a performer of, rather than as a source of funds for, R&D. Thus, data on Federal support of R&D activities performed by industry are collected and resulting statistics appear in several tables, but statistics on industrial funding of R&D undertaken at universities and colleges and

other nonprofit organizations are not collected and therefore are not included in the tables.¹

Industry statistics are developed from data collected from individual companies or enterprises. Since the survey is enterprise based rather than establishment based, all data collected for the various subparts of each enterprise (plants, divisions, or subdivisions) are tabulated in the major standard industrial classification (SIC) of the company. The resulting industry estimates are reported using the SIC of the companies within the each industry. National totals are estimated by summing the industry estimates.

All companies known, through previous surveys or through outside information sources, to spend more than \$1 million annually on R&D in the United States or to have 1,000 or more employees receive a survey questionnaire every year. Remaining firms are subjected to probability sampling and may or may not receive a questionnaire for a given survey year. Among the organizations purposely excluded from the survey are trade associations and not-for-profit consortia. Although their primary mission is to serve industry, these associations are established as non-profit organizations.

Respondents receive detailed definitions to help them determine which expenses to include or exclude from the R&D data they provide. Nevertheless, the statistics presented in this report are subject to response and concept errors caused by different respondent interpretations of the definitions of R&D activities and by variations in company accounting procedures. Consequently, the statistics are better indicators of changes in, rather than absolute levels of R&D spending and personnel.

The National Science Foundation (NSF) has sponsored a survey of industrial R&D since 1953.

¹ Data on R&D performed at universities and colleges are collected in the annual Survey of Scientific and Engineering Expenditures at Universities and Colleges. More information about this survey is available from NSF's R&D Statistics Program in the Division of Science Resources Studies at the address given in "General Notes," preceding section A.

The two surveys covering the 1953-56 period were conducted by the Bureau of Labor Statistics (BLS), U.S. Department of Labor.² Since 1957 the Bureau of the Census has conducted the survey.³ NSF's Division of Science Resources Studies sponsors and monitors the survey.

The content of the survey has been expanded and refined over the years in response to an increasing need by policymakers for more detailed information on the Nation's R&D effort. For example, questions on energy R&D were added in the early seventies, following the first oil-shortage crisis. On the other hand, the frequency of collection of certain data items has been reduced in recent years in an attempt to alleviate some of the respondent burden that has been placed on industry from all sources. For large firms known to perform R&D, a detailed questionnaire, Form RD-1L, is used to collect data for odd-numbered years and an abbreviated version, Form RD-1S, is used to collect data for even-numbered years. To further limit reporting burden on small R&D performers and on firms that are included in the sample for the first time, an even more abbreviated form, Form RD-1A, which collects only the most crucial data, is used each year. This report provides data collected from the abbreviated forms, RD-1S and RD-1A.

Several changes have been made to the survey recently that are of special importance to users of this report. Prior to the 1992 survey, statistics were based

on samples selected at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987). In intervening years a subset of the last sample (called a "panel") was used. The most recent sample prior to the 1992 survey was selected and first used for survey year 1987. Estimates for 1988 through 1991 were based on surveys of the panel of companies that reported R&D activity in the 1987 survey. Beginning with the 1992 survey, statistics are based on samples selected annually. Also, beginning with the 1992 survey, the sample size was increased from approximately 14,000 to nearly 23,400 firms. This increase was made for several reasons: (1) to better account for births of R&D-performing establishments in the survey universe, (2) to survey more fully and accurately R&D performed by nonmanufacturing firms (especially in the service sector and by small firms in all industries), and (3) to gather more current information about potential R&D performers. In this report tables containing historical statistics are presented in two ways. For the tables in section A, estimates from the 1992 survey are linked with estimates from the 1987 survey. The linking was accomplished using an algorithm that preserved to the greatest extent possible year-to-year trends for each industry. A full explanation of the linking process used is explained in this section, under "Comparability of Statistics". Also under "Comparability of Statistics," there is a series of tables for which no attempt was made to link the estimates derived from data collected in the 1992 survey to estimates derived from data collected in previous surveys.

² See National Science Foundation, *Science and Engineering in American Industry: Final Report on a 1953-54 Survey* (NSF 56-16) and *Science and Engineering in American Industry: 1956* (NSF 59-50) (Washington, DC: Supt. of Documents, GPO, 1956 and 1960).

³ Data obtained in the earlier BLS surveys are not directly comparable with Census figures because of methodological and other differences.

SURVEY METHODOLOGY⁴

Reporting Unit

The reporting unit for the Survey of Industrial Research and Development is the enterprise, or company, defined as a business organization of one or more establishments under common ownership or control. The survey includes two groups of enterprises: (i) companies known to conduct research and development (R&D) and (ii) a sample representation of companies for which information on the extent of R&D activity is uncertain.

Frame Creation

The Standard Statistical Establishment List (SSEL), a Bureau of the Census compilation that contains information on over 3 million establishments with paid employees, was the universe from which the frame used to select the 1992 survey sample was created (see table B-1 for universe and sample sizes). For companies with more than one establishment, data were summed to the company level. The firm was then assigned a single standard industrial classification (SIC) code based on the activity of the establishment(s) having the highest dollar value of payroll. This assignment was done on a hierarchical basis. The enterprise was first assigned to the economic division (manufacturing or nonmanufacturing) with the highest payroll, then to the 2-digit SIC code with the highest payroll within the assigned division, then to the 3-digit SIC code with the highest payroll within the assigned 2-digit industry.

The frame from which the survey sample was drawn included all for-profit companies classified in nonfarm industries. For surveys prior to 1992, the frame was limited to companies above certain size criteria based on number of employees. These criteria varied by industry. Also, some industries were excluded from the frame because it was believed that these industries contributed little or no R&D activity to the final survey estimates. For the 1992 sample,

new industries were added to the frame⁵ and the size criteria were lowered considerably and applied uniformly to firms in all industries. As a result, nearly 2 million enterprises with 5 or more employees were given a chance of selection. For comparison, the frame for the 1987 sample included 154,000 companies of specified sizes and industries.

External information about the likelihood that a company conducted R&D was used to identify nearly 10,000 companies that were included in the survey sample with certainty. External sources included prior R&D surveys, directories that include company information on R&D reported to the Securities and Exchange Commission, commercially available directories of R&D performing companies, Department of Defense directories of contracts awarded for R&D, and various publications and newsletters that highlight firms conducting R&D. In addition, all companies in the frame with 1,000 employees or more were selected with certainty.

Sample Selection

Probability Proportionate to Size

As with most types of economic surveys, the sample was selected using probabilities proportionate to size. That is, large companies had a higher probability of selection than did small companies. For this survey it would have been ideal if company size could have been determined by the amount of R&D expenditures. Unfortunately, except for the companies that were in a previous survey or for which there was information from external sources, it was impossible to know the R&D expenditure values for firms in the universe. Consequently, most companies' R&D expenditures had to be estimated and the probability of selection, based on the estimated values.

Since total employment was known for each company in the universe, it was possible to use an already-observed relationship between employment and R&D to estimate R&D expenditure values for companies in the frame. This was the same strategy employed in the 1981 and 1987 sampling operations. For 1992 sampling, data collected in the 1991 survey was used to derive this relationship separately for single-unit

⁴ Information for this section was provided by the Industry Division of the Bureau of the Census, the collecting and compiling agent for the National Science Foundation. Copies of the technical papers cited can be obtained by contacting NSF's R&D Statistics Program in the Division of Science Resources Studies at the address given in "General Notes," preceding section A.

⁵ These industries are listed and discussed under "Comparability of Statistics," later in this section.

Table B-1. Number of companies in the universe and sample: 1992

Industry	SIC code	Number of companies in the universe	Number of companies selected for the probability portion of the sample	Number of companies selected for the sample with certainty	Number of companies that reported R&D for 1992	Number of companies sent a long questionnaire, RD-IS	Page 1 of 2
Total.....		1,775,985	12,218	11,158	5,008	1,421	
MANUFACTURING		196,702	6,697	5,121	4,025	1,149	
Total.....							
Distribution by industry							
Food, kindred, and tobacco products.....	20,21	10,501	115	267	149	60	
Textiles and apparel.....	22,23	16,357	296	361	125	33	
Lumber, wood products, and furniture.....	24,25	22,745	1,590	200	154	24	
Paper and allied products.....	26	3,152	117	105	74	34	
Chemicals and allied products.....	28	5,127	248	329	364	144	
Industrial chemicals.....	281-82,286	874	25	76	82	46	
Drugs and medicines.....	283	745	3	102	86	42	
Other chemicals.....	284-85,287-89	3,508	220	151	196	56	
Oil and Gas Extraction.....	13	6,500	604	166	41	12	
Petroleum refining and related industries.....	29	640	105	70	46	14	
Rubber products.....	30	8,568	101	164	146	39	
Stone, clay, and glass products.....	32	7,350	269	145	101	26	
Primary metals.....	33	3,323	286	314	146	48	
Ferrous metals and products.....	331-32,3398-99	1,419	181	150	76	25	
Nonferrous metals and products.....	333-36	1,904	105	164	70	23	
Fabricated metal products.....	34	22,154	357	306	258	62	
Machinery.....	35	30,780	866	864	797	218	
Office, computing, and accounting machines.....	357	1,283	1	162	136	62	
Other machinery, except electrical.....	351-56,358-59	29,497	865	702	661	156	
Electrical equipment.....	36	9,396	776	692	763	188	
Radio and TV receiving equipment.....	365	396	25	29	22	4	
Communication equipment.....	366	1,012	186	136	209	39	
Electronic components.....	367	3,869	235	221	282	73	
Other electrical equipment.....	361-64,369	4,119	330	306	250	72	
Transportation equipment.....	37	5,633	50	206	151	78	
Motor vehicles and motor vehicles equipment.....	371	2,513	3	83	60	34	
Other transportation equipment.....	373-75,379	2,082	41	67	40	9	
Aircraft and missiles.....	372,376	1,038	6	56	51	35	

See SOURCE at end of table.

Table B-1. Number of companies in the universe and sample: 1992

Industry	SIC code	Number of companies in the universe	Number of companies selected for the probability portion of the sample	Number of companies selected for the sample with certainty	Number of companies that reported R&D for 1992	Number of companies sent a long questionnaire, RD-IS	Page 2 of 2
Scientific and mechanical measuring instruments.....	381-82	2,722	137	244	278	85	
Optical, surgical, photographic, and other instruments.....	384-87	2,814	175	263	241	52	
Other manufacturing industries.....	27,31,39	38,940	605	425	191	32	
NONMANUFACTURING							
Total.....		1,579,283	5,521	6,037	983	272	
07	26,906	255	7	2	1	0	
08	446	102	29	3	0	0	
09	250	54	20	4	0	0	
10	208	5	15	10	5	1	
12	1,315	69	17	5	1	1	
14	1,821	30	15	11	6	0	
15	34,318	325	33	4	0	0	
16	14,638	103	48	9	4	3	
17	123,821	377	45	12	3	2	
40	267	10	16	6	2	2	
48	7,884	13	84	26	15	37	
49	4,143	35	159	87	62	62	
73	44,285	1,265	535	195	5	5	
80	13,016	954	1,190	85	205	55	
87	27,940	201	340	205	55	55	
89	3,090	456	58	32	2	2	
	99	1,274,935	1267	326	287	74	

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

companies and multiestablishment companies. The effect in all cases was to give firms with a large number of employees higher probability of selection since it was assumed that large companies were more likely to perform R&D and that the amount of R&D was proportionate to the size of the company.

Sample Stratification and Relative Standard Error Constraints

The particular sample selected was one of a large number of the same type and size that by chance might have been selected. Statistics resulting from the different samples would differ somewhat from each other. These differences are represented by estimates of sampling error. The smaller the sampling error, the more precise the statistic.

To control sampling error in the statistics resulting from this survey, parameters were specified to allocate the sample across various levels, or strata, that corresponded to industry groupings. These parameters permitted the sample size to be varied to achieve a desired level of sampling error for each stratum and were assigned so that estimated errors of total R&D for industries in these strata did not exceed certain levels. Sample sizes among the strata were only constrained by the limit placed on the total sample size dictated by the available budget.

For sample selections prior to 1992, the strata designations were the published industry categories. The sample was allocated across these industry categories to provide high, medium, and low levels of precision. For the 1992 sample the criteria for this allocation were modified. In order to gather information to review and evaluate the appropriateness of the published industry groupings, the allocation of the sample was controlled for levels of industry detail below those traditionally published. The result was that the frame was partitioned into 95 manufacturing industry strata and 25 nonmanufacturing strata.

Each industry was allocated to one of three groups. The first group was formulated to analyze the distribution of data in manufacturing industries. In this group each 3-digit manufacturing industry was considered a separate stratum. The second group was formulated to improve coverage and to identify emerging industries. In this group, selected 2-digit and 3-digit nonmanufacturing industries each were considered a separate stratum. The industries were

identified as those for which statistics had been published previously and those with high concentrations of scientists and engineers as reported in occupational surveys. The third group was a large stratum of companies in nonmanufacturing industries that had not been included in previous sampling frames or for which there was little indication of R&D activity.

Once the strata were defined, the following criteria were used to achieve the target sampling error for total R&D.

- a. Sampling error not to exceed 2 percent for: 44 3-digit manufacturing industries that contribute to a current publication level below the 2-digit industry level and 15 3-digit nonmanufacturing industries that represent a current publication level or for which there is a high concentration of scientists or engineers.
- b. Sampling error not to exceed 5 percent for: 51 3-digit manufacturing industries that are part of currently published 2-digit or aggregations of 2-digit industries; 9 2-digit nonmanufacturing industries for which R&D activity was likely, and 1 stratum of remaining nonmanufacturing industries for which there was little prior indication of R&D activity.

Based on the desired precision represented by these sampling error estimates, the criteria suggested a total sample size of approximately 23,000.

A limitation of the sample allocation process should be noted. Sampling errors were controlled by using a universe total that, in large part, was improvised. That is, as previously noted, an R&D value was assigned to every company in the frame, even though many of these companies actually may not have had R&D expenditures. The value assigned was imputed for the majority of companies in the frame and, as a consequence, the estimated universe and the distribution of individual company values did not necessarily reflect the true distribution. Estimates of sampling variability were nevertheless based on this distribution. The presumption was—and this had been confirmed using the previous sample selection—that actual variation in the sample design would be less than that estimated, because many of the sampled companies have true R&D values of zero, not the widely varying values that were imputed using total employment as a predictor of R&D. Thus, the 2-

percent and 5-percent error levels described earlier are conservative. (See table B-2 for a list by industry of the actual standard error estimates for total R&D.)

In addition to sampling error, the estimates are subject to nonsampling error. Errors are grouped into five categories: specification, coverage, response, nonresponse, and processing. For detailed discussions on the sources, control, and measurement of each of these types of error, see the technical reports cited below.⁶

Sample Size and Weighting

The sample was selected with a target sample size of 23,000 and with other parameters set to ensure compliance with the standard error constraints. An actual sample of 23,376 was selected. The actual sample size differed from the target for two reasons. First, the sample frame was subjected to independent sampling. Each company in the frame had an independent chance of selection, based on its assigned probability, i.e., selection of a company was completely independent of the selection of any other company. In independent sampling, sample size itself is a random variable. Theoretically, a sample of size zero or a sample the size of the entire universe is possible, but the probabilities of these extremes are so small that these are nearly impossible situations. The actual sample size is usually quite close to the specified size. If there is too much deviation, the selection is simply executed again.

Second, a minimum probability rule was imposed. As noted earlier, probabilities of selection proportionate to size are assigned to each company, where size is the imputed R&D value assigned each company. Selected companies that report actual R&D expenditures vastly larger than their assigned values can have adverse effects on the statistics, which are based on the weighted value of survey responses.⁷ To lessen the effects on the final statistics, the maximum weight a

company could assume was arbitrarily controlled by specifying the probability of the company's selection. If the probability, based on company size, was less than the arbitrarily set minimum, then the probability was set equal to the minimum value. The consequence of raising these original probabilities to the minimum probability was to raise the expected sample size. It is likely that most of the difference between the size of the target sample and the actually selected sample was because of this rule.

Survey Questionnaires

Two questionnaires are used each year to collect data for the survey. For large firms known to perform R&D, a detailed questionnaire, Form RD-1L, is used to collect data for odd-numbered years and an abbreviated version, Form RD-1S, is used to collect data for the even-numbered years. The questionnaires are cycled in this manner to reduce reporting burden on survey respondents.

The Form RD-1L requests data on sales or receipts, total employment, employment of scientists and engineers, expenditures for R&D performed within the company with Federal funds and with company and other funds, character of work (basic research, applied research, and development), company-sponsored R&D expenditures in foreign countries, R&D performed under contract to others, expenditures for pollution abatement and energy R&D, detail on R&D by product field, Federal R&D support to the firm by contracting agency, domestic R&D expenditures by State, and foreign R&D by country. The Form RD-1S requests the same information except for the last four items. Because companies receiving the Forms RD-1L and RD-1S generally have participated in previous surveys, computer imprinted data reported by the company for the previous year is supplied for reference. Companies are encouraged to revise or update this imprinted data if they have more current information.

⁶ U.S. Department of Commerce, Bureau of the Census, *Documentation of Nonsampling Issues in the Survey of Industrial Research and Development*, RR94/03 (Washington, DC, Sept. 1994) and U.S. Department of Commerce, Bureau of the Census, *A Study of Processing Error in the Survey of Industrial Research and Development*, ESMD-9403 (Washington, DC, Sept. 1994)

⁷ The weight given to a company selected for the survey is the inverse of its probability of selection. Companies selected for the sample with certainty (see "Frame Creation" above) represented only themselves, and each had a weight of 1.0.

Table B-2. Standard error of estimate (percentage) of total (company, Federal, and other) funds for industrial R&D performance for all company size groups and for companies with fewer than 1,000 employees, by industry: 1992

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Industry	SIC code	Standard error 1/	Standard error of companies with fewer than 1,000 employees
Total.....		4.8	25.3
Food, kindred, and tobacco products.....	20,21	2.9	41.2
Textiles and apparel.....	22,23	7.7	9.3
Lumber, wood products, and furniture.....	24,25	5.8	22.0
Paper and allied products.....	26	3.9	63.1
Chemicals and allied products.....	28	1.4	18.9
Industrial chemicals.....	281-82,286	1.5	33.0
Drugs and medicines.....	283	2.4	43.2
Other chemicals.....	284-85,287-89	3.2	15.0
Petroleum refining and extraction.....	13,29	1.4	35.4
Rubber products.....	30	20.2	53.9
Stone, clay, and glass products.....	32	1.8	18.8
Primary metals.....	33	2.4	18.3
Ferrous metals and products.....	331-32,3398-99	2.8	26.7
Nonferrous metals and products.....	333-36	3.6	23.8
Fabricated metal products.....	34	12.6	44.7
Machinery.....	35	1.6	14.1
Office, computing, and accounting machines.....	357	0.0	0.0
Other machinery, except electrical.....	351-56,358-59	6.8	21.3
Electrical equipment.....	36	1.3	18.5
Radio and TV receiving equipment.....	365	5.8	23.1
Communication equipment.....	366	1.4	12.6
Electronic components.....	367	4.3	11.4
Other electrical equipment.....	361-64,369	1.0	13.9
Transportation equipment.....	37	0.1	17.1
Motor vehicles and motor vehicles equipment.....	371	0.0	0.0
Other transportation equipment.....	373-75,379	0.5	7.2
Aircraft and missiles.....	372,376	0.1	23.6
Professional and scientific instruments.....	38	2.1	12.0
Scientific and mechanical measuring instruments.....	381-82	1.0	5.6
Optical, surgical, photographic, and other instruments.....	384-87	4.6	23.9
Other manufacturing industries.....	27,31,39	10.1	28.3
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	19.2	40.3

1/ A description of the standard error of estimate is given under "Methodology of Survey." The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentages shown by the associated estimates. For example, since the relative standard error of estimate for R&D performance for all company size groups in the chemicals industry (SIC 28) is 1.4 percent, and the associated total R&D estimate for this industry is \$16,711 million, the standard error of estimate is .014 times 16,711 or 234.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

No prior-year information is available since the majority of the companies have not reported previously.⁸

For the 1992 survey, about 1,600 companies received Form RD-1S and nearly 22,000 received Form RD-1A. Of the 22,000 firms, 1,760 reported R&D expenditures. Both questionnaires and the instructions provided to respondents are reproduced in section C, Survey Documents.

Followup for Survey Nonresponse

The 1992 survey questionnaires were mailed in May 1993, and recipients were asked to respond within 60 days. Thirty days later, letters were mailed to all survey recipients reminding them that their completed questionnaire was due within the next 30 days. After 60 days, followup letters were sent to all nonresponding firms. Two additional followup mailings were made to persistent nonrespondents, after 90 and 120 days. The 90-day followup mailing included a replacement questionnaire.

In addition to the mailings, telephone followup was used to encourage response from those firms ranked among the 300 largest R&D performers, based on total R&D expenditures reported in the previous survey. Telephone followup was also used for these firms during the initial data edit phase of survey operations if data items were missing or unclear.

Imputation for Item Nonresponse

For various reasons, many firms chose to return the survey questionnaires with one or more blank items.⁹ For instance, the internal accounting procedures of the firm may not have allowed it to quantify the pollu-

⁸ For the 1992 survey, companies were asked to report R&D expenditures for both the current and previous years. For subsequent years, only current-year data will be requested.

⁹ For detailed discussions on the sources, control, and measurement of error resulting from item nonresponse, see the technical report: U.S. Department of Commerce, Bureau of the Census, *Documentation of Nonsampling Error Issues in the Survey of Industrial Research and Development*, RR94/03 (Washington, DC, Sept. 21, 1994). For a general discussion of the problems stemming from item nonresponse, see the technical report: National Science Foundation, *Estimating Basic and Applied Research and Development in Industry: A Preliminary Review of Survey Procedures*, NSF 90-322 (Washington, DC, 1990).

tion-abatement expenditures portion of R&D. In addition, some firms, as a matter of policy, refused to answer any voluntary questions.¹⁰

When respondents did not provide the requested information, estimates for the missing data were made using imputation algorithms. In general, the imputation algorithms computed values for missing items by applying the average percentage change for the target item in the nonresponding firm's industry to the item's prior-year value for that firm, reported or imputed. This approach, with minor variation, was used for most items.¹¹ Table B-3 contains imputation rates for the principal survey items.

Character of work

Response to questions about character of work (basic research, applied research, and development) declined in the mid-1980s and, as a result, imputation rates increased. The general imputation procedure described above became increasingly dependent upon information imputed in prior years, thereby distancing current-year estimates from any reported information. Because of the increasing dependence on imputed data, NSF chose not to publish character-of-work estimates in 1986. Consequently, the imputation procedure used to develop these estimates was revised in 1987 for use with 1986 and later data and differs from the general imputation approach. The new method calculates the character-of-work distribution for a nonresponding firm only if that firm reported a distribution within a 5-year period, extending from 2 years before to 2 years after the year requiring imputation. Imputation for a given year is initially performed in the year the data are collected and is based on a character-of-work distribution reported in either of the 2 previous years, if any. It is again performed using new data collected in the next 2 years. Thus, character-of-work estimates are revised as newly

¹⁰ All but four items—total R&D, Federal R&D, net sales, and total employment—which are included in the Census Bureau's annual mandatory statistical program, are voluntary. See further discussion under "Response Rates" and "Mandatory Versus Voluntary Reporting," below.

¹¹ For detailed descriptions and analyses of the imputation methods and algorithms used, see the technical report: U.S. Department of Commerce, Bureau of the Census, *An Evaluation of Imputation Methods for the Survey of Industrial Research and Development*, ESMD-9404 (Washington, DC, Sept. 1994).

Table B-3. Imputation rates for selected items, by industry: 1992

[Percent]

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Industry	SIC code	Sales and Employment			Research and Development			Selected R&D Data		
		Net sales	Total employment	Scientists/engineers	Total R&D	Company R&D	Federal R&D	Energy R&D	Pollution abatement	Foreign R&D
Total.....		2.7	0.9	27.4	5.2	27.7	30.0	47.5	51.9	7.9
Food, kindred, and tobacco products.....	20-21	4.4	6.6	31.6	6.4	22.8	1/	0.0	8.5	0.0
Textiles and apparel.....	22-23	9.7	7.5	33.2	6.0	18.9	59.0	1/	100.0	6.9
Lumber, wood products, and furniture.....	24-25	3.2	0.7	31.0	0.8	22.0	0.0	0.0	0.0	0.0
Paper and allied products.....	26	6.4	4.9	24.2	5.4	25.1	0.0	98.3	33.7	0.9
Chemicals and allied products.....	28	5.5	4.8	30.4	2.7	31.3	76.6	87.7	21.5	1.1
Industrial chemicals.....	281-82-286	9.5	7.9	31.1	6.3	31.0	75.7	88.8	27.4	0.0
Drugs and medicines.....	283	1.7	2.3	34.5	0.8	37.5	61.9	0.0	4.9	1.6
Other chemicals.....	284-85-287-89	3.4	3.5	18.7	1.9	9.4	90.4	1.1	9.4	0.9
Petroleum refining and extraction.....	13-29	3.9	2.9	26.2	0.3	34.8	0.9	48.4	5.9	0.0
Rubber products.....	30	3.7	4.4	27.9	9.7	44.4	0.0	0.0	15.9	2.3
Stone, clay, and glass products.....	32	2.3	1.2	42.1	0.4	11.6	95.6	15.4	0.0	9.1
Primary metals.....	33	6.7	5.3	43.9	17.3	28.3	56.6	8.5	10.1	0.0
Ferrous metals and products.....	331-32-3398-99	1.1	1.1	20.5	0.7	7.5	0.0	8.8	0.0	0.0
Nonferrous metals and products.....	333-36	14.4	8.4	55.3	28.7	42.9	64.6	0.0	46.9	0.0
Fabricated metal products.....	34	2.1	2.1	25.3	3.3	21.6	21.3	98.3	47.8	8.4
Machinery.....	35	5.8	4.0	23.3	2.9	29.1	2.8	54.4	58.8	3.1
Office, computing, and accounting machines.....	357	1.5	0.9	23.4	1.9	28.5	0.0	2.5	21.2	2.5
Other machinery, except electrical.....	351-56-358-59	9.7	6.7	22.9	6.8	31.3	19.5	81.9	63.4	6.4
Electrical equipment.....	36	7.8	9.5	33.8	10.1	29.7	13.6	0.2	1.5	33.9
Radio and TV receiving equipment.....	365	3.0	6.2	12.2	7.8	7.8	0.0	1/	1/	46.6
Communication equipment.....	366	19.3	17.2	64.4	20.5	36.5	26.8	0.0	12.4	84.1
Electronic components.....	367	4.6	3.9	18.7	2.3	31.4	11.3	0.0	0.0	16.2
Other electrical equipment.....	361-64-369	5.8	8.8	17.5	5.3	19.6	3.8	0.5	0.0	4.1
Transportation equipment.....	37	6.2	7.3	23.6	3.8	36.7	49.0	64.3	72.7	1.5
Motor vehicles and motor vehicles equipment.....	371	7.1	8.5	42.0	7.9	41.5	1.0	97.5	87.9	0.1
Other transportation equipment.....	373-75-379	0.2	0.2	93.7	82.0	100.0	1/	61.0	1/	0.0
Aircraft and missiles.....	372-376	6.0	7.0	11.6	1.3	27.5	52.6		12.5	10.4

Table B-3. Imputation rates for selected items, by industry: 1992

Industry	SIC code	Sales and Employment			Research and Development			Selected R&D Data		
		Net sales	Total em- ployment	Scientists/ engineers	Total R&D	Company R&D	Federal R&D	Energy R&D	Pollution abatement	Foreign R&D
Professional and scientific instruments.....	38	1.6	1.4	53.7	1.6	27.4	21.6	79.2	1.2	1.8
Scientific and mechanical measuring instruments.....	381-82	2.1	1.4	57.6	2.0	20.5	22.2	79.4	3.7	9.7
Optical, surgical, photographic, and other instruments.....	383-87	1.1	1.3	43.4	1.2	32.3	6.7	0.0	0.0	0.1
Other manufacturing industries.....	21,27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	0.7 1.4	0.6 0.3	26.7 17.6	7.8 7.9	13.0 17.6	0.0 11.5	100.0 39.0	0.0 54.8	1.0 52.0

1/ No basis for imputation.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

reported information becomes available and are not final for 2 years following their initial publication.

If no reported data are available for a firm, character-of-work estimates are not imputed. As a consequence, only a portion of the total estimated R&D expenditures are distributed at the firm level. Those expenditures not meeting the requirements of the new imputation methodology are placed in a "not distributed" category. Tables B-4 through B-8 show the character-of-work estimates along with the "not distributed" component for 1988-92, respectively.

NSF's objective in conducting the survey has always been to provide estimates for the entire population of firms performing R&D in the United States, however, the revised imputation procedure would no longer produce such estimates because of the "not distributed" component. So, a baseline estimation method was developed to allocate the "not distributed" amounts among the character-of-work components. In the baseline estimation method, the "not distributed" expenditures are allocated, by industry group, to basic research, applied research, and development categories, using the percentage splits in the distributed category for that industry. The allocation is done at the lowest level of published industry detail only; higher levels are derived by aggregation (just as national totals are derived by aggregation of individual industry estimates), and results in higher performance shares for basic and applied research and lower estimates for development's share than would have been calculated using the previous method.¹² The estimates of basic research, applied research, and development provided in section A of this report were calculated using the baseline estimation method.

Response Rates and Mandatory Versus Voluntary Reporting

Detailed unit and item response rates are shown in tables B-9 and B-10, respectively. Table B-9 shows the number of companies in each industry or group of industries that received a questionnaire and the percentage that responded to the survey. Table B-10 shows the percentage of firms with R&D expenditures that also reported data for selected items or groups of items.

¹² See the NSF technical report cited above for an explanation of the uncertainties in the data and to quantify their sensitivity to the choice of various possible imputation procedures.

Current survey reporting requirements divide survey items into two groups: mandatory and voluntary. Response to four data items on the questionnaires (total R&D expenditures, Federal R&D funds, net sales, and total employment) is mandatory, whereas response to the remaining items is voluntary. During the 1990 survey cycle, NSF conducted a test of the effect of reporting on a completely voluntary basis to determine if combining both mandatory and voluntary items on one questionnaire influences response rates. For this test, the 1990 sample was divided into two panels of approximately equal size. One panel, the mandatory panel, was asked to report as usual (four mandatory items and the remainder voluntary), and the other panel, the voluntary panel, was asked to report all items on a completely voluntary basis. The result of the test was a decrease in the overall survey response rate to 80 percent from levels of 88 percent in 1989 and 89 percent in 1988. The response rates for the mandatory and voluntary panels were 89 percent and 69 percent, respectively. Detailed results of the test were published in *Research and Development in Industry: 1990*.

Comparability of Statistics

Summarized in this section are the statistical revisions that have been made because of changes in survey procedures and practices.¹³ This section is divided into two parts. The first focuses on the current-year survey with a discussion of recent survey improvements and the effects these have had on current-year and immediate prior-year statistics. The second part describes revisions made to statistics produced from pre-1992 surveys.

Current-Year Considerations

Recent Survey Improvements¹⁴

Before the 1992 survey, the sample of firms surveyed was selected at irregular intervals.¹⁵ In

¹³ See also the technical paper U.S. Department of Commerce, Bureau of the Census, *Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

¹⁴ See also National Science Foundation, *SRS Data Brief, "1992 R&D Spending by U.S. Firms Rises, NSF Survey Improved"* (NSF 94-325), (Arlington, VA, Sept. 9, 1994).

¹⁵ During the early years of the survey, until 1967, samples were selected every 5 years. Subsequent samples were selected for 1967, 1971, 1976, 1981, and 1987.

Table B-4. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1988

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]										
Total.....		\$97,016	\$30,343	\$66,672	\$3,046	\$731	\$2,315	\$14,762	\$3,255	\$11,507
Food, kindred, and tobacco products.....	20-21	(D)	(D)	1,173	(D)	0	(D)	(D)	0	(D)
Textiles and apparel.....	22-23	(D)	(D)	215	(D)	0	(D)	(D)	0	(D)
Lumber, wood products, and furniture.....	24-25	(D)	(D)	165	(D)	0	(D)	(D)	37	(D)
Paper and allied products.....	26	(D)	(D)	752	35	0	(S)	(S)	0	(D)
Chemicals and allied products.....	28	11,067	238	10,828	569	14	554	(D)	163	(D)
Industrial chemicals.....	281-82	286	233	3,939	224	14	210	(D)	127	2,952
Drugs and medicines.....	283	4,172	6	4,900	(S)	0	(S)	(D)	(D)	1,064
Other chemicals.....	284-85	287-89	0	1,989	28	0	28	(D)	0	1,286
Petroleum refining and extraction.....	13-29	1,997	22	1,975	(D)	0	54	(D)	(D)	602
Rubber products.....	30	(D)	(D)	718	22	0	22	(D)	(D)	705
Stone, clay, and glass products.....	32	(D)	(D)	697	128	0	128	(D)	(D)	51
Primary metals.....	33	637	17	620	66	0	66	(D)	(D)	332
Ferrous metals and products.....	331-32	3388-99	253	252	2	0	2	(D)	(D)	157
Nonferrous metals and products.....	333-36	384	16	368	64	0	64	(D)	(D)	70
Fabricated metal products.....	34	881	163	718	31	0	31	(D)	(D)	87
Machinery.....	35	(D)	(D)	11,929	(D)	0	31	(D)	(D)	87
Office, computing, and accounting machines.....	357	(D)	(D)	9,347	(D)	0	193	(D)	(D)	90
Other machinery, except electrical.....	351-56	358-59	2,682	101	2,582	(S)	0	143	(D)	1,694
Electrical equipment.....	36	14,128	4,153	9,975	390	17	374	(D)	(D)	1,399
Radio and TV receiving equipment.....	365	149	0	149	(D)	0	0	(D)	(D)	295
Communication equipment.....	366	8,427	3,630	4,798	(D)	0	2,422	(D)	(D)	580
Electronic components.....	367	4,133	449	3,684	(D)	0	0	(D)	(D)	(D)
Other electrical equipment.....	361-64	369	1,419	74	1,345	(S)	0	135	0	135
Transportation equipment.....	37	34,775	20,865	13,910	334	182	151	2,712	1,432	1,280
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	7,783	71	0	71	(D)	(D)	404
Other transportation equipment.....	373-75	379	24,168	18,402	361	(S)	0	(S)	(D)	96
Aircraft and missiles.....	372,376			5,766	258	182	75	2,111	1,330	780
Professional and scientific instruments.....	38	5,530	\$191	5,339	(D)	0	219	(D)	(D)	524
Scientific and mechanical measuring instruments.....	381-82	1,959	(S)	1,863	40	0	40	(D)	(D)	56
Optical, surgical, photographic, and other instruments.....	383-87	3,571	95	3,476	(D)	0	180	(D)	(D)	469
Other manufacturing industries.....	27,31,39	(D)	(D)	401	(S)	0	46	0	46	46
Nonmanufacturing industries.....	07-10	12-17,	10,513	3,256	7,257	888	508	380	1,909	697
	40-42, 44-49,									1,212
	50-59, 60-65, 67,									
	701, 73, 75-76,									
	78-79, 80-81,									
	83-84, 87, 89									

See explanatory information and SOURCE at end of table.

Table B-4. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1988

Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
Total.....		\$51,890	\$18,829	\$33,061	\$27,317	\$7,529	\$19,789	28.2	24.9	29.7
Food, kindred, and tobacco products.....	20-21	(D)	(D)	549	268	0	268	(D)	(D)	(D)
Textiles and apparel.....	22-23	(D)	(D)	92	(D)	0	103	(D)	(D)	47.7
Lumber, wood products, and furniture.....	24-25	(D)	(D)	60	50	0	50	(D)	0.0	30.6
Paper and allied products.....	26	256	0	256	298	0	298	(D)	0.0	39.6
Chemicals and allied products.....	28	4,189	95	4,094	3,230	3	3,227	29.2	1.3	29.8
Industrial chemicals.....	281-82	286	(D)	1,494	1,172	1	1,171	28.1	0.5	29.7
Drugs and medicines.....	283	(D)	(D)	1,528	1,772	2	1,770	36.1	36.1	36.1
Other chemicals.....	284-85	287-89	1,072	0	1,072	287	0	287	14.4	0.0
Petroleum refining and extraction.....	13-29	620	6	614	613	11	602	30.7	52.4	30.5
Rubber products.....	30	(D)	(D)	179	466	0	466	(D)	0.0	64.8
Stone, clay, and glass products.....	32	179	0	179	58	0	58	(D)	0.0	8.3
Primary metals.....	33	(D)	(D)	248	152	2	150	23.8	9.4	24.2
Ferrous metals and products.....	331-32	3398-99	(D)	(D)	70	111	0	111	43.8	0.0
Nonferrous metals and products.....	333-36	(D)	(D)	179	41	2	39	10.6	10.0	10.6
Fabricated metal products.....	34	(D)	(D)	256	397	55	341	45.0	33.8	47.5
Machinery.....	35	(D)	(D)	7,985	2,130	73	2,057	(D)	(D)	17.2
Office, computing, and accounting machines.....	351-56	355-59	(D)	(D)	6,688	1,117	0	1,117	(D)	0.0
Other machinery, except electrical.....	(D)	(D)	(D)	1,297	1,013	73	940	37.8	72.4	36.4
Electrical equipment.....	36	7,893	2,734	5,158	3,422	907	2,516	24.2	21.8	25.2
Radio and TV receiving equipment.....	365	(D)	0	(D)	1,156	0	1,156	90.6	0.0	90.6
Communication equipment.....	366	5,845	(D)	(D)	1,410	734	677	16.7	20.2	14.1
Electronic components.....	367	(D)	(D)	1,285	1,239	134	1,105	30.0	29.9	30.0
Other electrical equipment.....	361-64	369	550	35	515	639	39	600	45.0	52.4
Transportation equipment.....	37	22,244	13,697	8,548	5,554	9,485	5,554	3,930	27.3	26.6
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	1,603	3,210	826	2,384	(D)	(D)	30.6
Other transportation equipment.....	373-75	379	15,836	12,297	3,540	311	136	175	(D)	48.6
Aircraft and missiles.....	372,376				5,964	4,593	1,371	24.7	25.0	23.8
Professional and scientific instruments.....	38	1,725	122	1,603	3,020	28	2,992	54.6	14.8	56.0
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	274	1,514	20	1,494	77.3	20.8	80.2
Optical, surgical, photographic, and other instruments.....	383-87	(D)	(D)	1,329	1,507	9	1,498	42.2	9.4	43.1
Other manufacturing industries.....	27,3139	241	0	241	(D)	64	(D)	16.1	16.1	16.1
Nonmanufacturing industries.....	07-10	1,12-17	(D)	2,998	3,570	904	2,666	34.0	27.8	36.7
	40-42	44-49								
	50-59	60-65,67,								
	701	73,75-76,								
	78-79	80-81,								
	83-84	87,89								

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B-5. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1989

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]										
Total.....		\$102,055	\$28,554	\$73,501	\$3,791	\$1,050	\$2,741	\$16,895	\$3,567	\$13,328
Food, kindred, and tobacco products.....	20,21	(D)	(D)	1,244	(S)	0	(S)	(D)	(D)	354
Textiles and apparel.....	22,23	(D)	(D)	223	(D)	0	(D)	13	0	13
Lumber, wood products, and furniture.....	24,25	192 ^q	0	192	(D)	0	(D)	(D)	0	(D)
Paper and allied products.....	26	879	0	879	35	0	35	155	0	155
Chemicals and allied products.....	28	12,069	126	11,943	700	11	688	3,602	13	3,588
Industrial chemicals.....	281-82,286	4,451	111	4,340	256	11	244	(D)	(D)	1,166
Drugs and medicines.....	283	(D)	(D)	5,512	(D)	0	(S)	(D)	(D)	1,730
Other chemicals.....	284-85,287-89	(D)	(D)	2,091	48	0	(S)	(D)	(D)	692
Petroleum refining and extraction.....	13,29	2,180	(S)	2,162	(D)	0	76	(D)	(D)	708
Rubber products.....	30	(D)	(D)	615	(D)	0	21	(D)	(D)	57
Stone, clay, and glass products.....	32	(D)	(D)	688	22	666	70	0	(D)	264
Primary metals.....	33	688	(D)	244	(D)	0	70	(D)	(D)	165
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	422	(D)	0	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	(D)	(D)	178	726	26	0	(D)	(D)	95
Fabricated metal products.....	34	904	14,497	1,155	13,342	(D)	(D)	(S)	(D)	2,355
Machinery.....	35	(D)	(D)	10,725	(D)	0	(S)	(D)	(D)	2,027
Office, computing, and accounting machines.....	357	(D)	(D)	2,618	63	0	63	(D)	(D)	328
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	(D)	(D)	0	(D)	(D)	(D)	(D)
Electrical equipment.....	36	13,318	3,743	9,575	(D)	0	378	(D)	(D)	1,878
Radio and TV receiving equipment.....	365	96	0	96	(D)	0	(D)	(D)	(D)	(D)
Communication equipment.....	366	7,071	2,911	4,159	(D)	14	56	(D)	(D)	1,190
Electronic components.....	367	4,025	369	3,655	(D)	0	(D)	(D)	(D)	259
Other electrical equipment.....	361-64,369	2,127	463	1,664	(S)	0	259	(D)	(D)	(D)
Transportation equipment.....	37	33,859	19,262	14,596	498	347	150	2,771	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	8,756	56	0	56	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	337	3	0	(S)	(D)	0	(D)
Aircraft and missiles.....	372,376	22,331	16,828	5,503	439	347	92	2,072	1,326	746
Professional and scientific instruments.....	38	5,992	\$263	5,729	(D)	0	205	603	97	506
Scientific and mechanical measuring instruments.....	381-82	2,366	162	2,205	(S)	0	(S)	(D)	0	21
Optical, surgical, photographic, and other instruments.....	383-87	3,626	101	3,525	(D)	0	174	(D)	(D)	486
Other manufacturing industries.....	27,31,39	(D)	438	(S)	0	(S)	56	0	56	56
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	14,031	3,729	10,302	1,282	664	618	2,641	896	1,745

See explanatory information and SOURCE at end of table.

Table B-5. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1989

Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
Total.....		\$53,823	\$16,224	\$37,599	\$27,545	\$7,713	\$19,833	27.0	27.0	27.0
Food, kindred, and tobacco products.....	20,21	(D)	(D)	589	238	0	238	(D)	0.0	19.2
Textiles and apparel.....	22,23	84	(D)	(D)	117	0	117	(D)	0.0	52.6
Lumber, wood products, and furniture.....	24,25	63	(D)	63	63	0	63	32.6	0.0	32.6
Paper and allied products.....	26	333	0	333	356	0	356	40.5	0.0	40.5
Chemicals and allied products.....	28	4,808	55	4,753	2,960	47	2,913	24.5	36.9	24.4
Industrial chemicals.....	281-82,286	(D)	(D)	1,598	1,378	47	1,331	30.9	41.8	30.7
Drugs and medicines.....	283	(D)	(D)	2,084	1,302	0	1,302	(D)	(D)	23.6
Other chemicals.....	284-85,287-89	(D)	(D)	1,070	280	0	280	(D)	(D)	13.4
Petroleum refining and extraction.....	13,29	710	3	707	686	14	671	31.5	81.3	31.1
Rubber products.....	30	(D)	(D)	233	556	0	556	(D)	(D)	64.1
Stone, clay, and glass products.....	32	(D)	(D)	178	50	2	48	(D)	(D)	7.8
Primary metals.....	33	(D)	(D)	279	152	2	151	22.2	7.4	22.7
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	72	109	1	108	(D)	(D)	44.1
Nonferrous metals and products.....	333-36	(D)	(D)	207	44	1	43	(D)	(D)	10.3
Fabricated metal products.....	34	(D)	(D)	238	(D)	(D)	(D)	367	(D)	50.6
Machinery.....	35	(D)	(D)	(S)	2,059	86	1,973	14.2	74	14.8
Office, computing, and accounting machines.....	357	(D)	(D)	(S)	1,223	0	1,223	(D)	(D)	11.4
Other machinery, except electrical.....	351-56,358-59	1,494	19	1,475	836	86	751	(D)	(D)	28.7
Electrical equipment.....	36	7,222	2,029	5,193	3,193	1,067	2,126	24.0	28.5	22.2
Radio and TV receiving equipment.....	365	(D)	0	(D)	81	0	81	84.5	0.0	84.5
Communication equipment.....	366	4,714	1,707	3,007	1,210	643	566	17.1	22.1	13.6
Electronic components.....	367	(D)	(D)	1,422	1,098	111	987	27.3	30.1	27.0
Other electrical equipment.....	361-64,369	905	(D)	(D)	805	313	492	37.8	67.6	29.6
Transportation equipment.....	37	21,448	(D)	(D)	9,143	5,483	3,660	27.0	28.5	25.1
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	3,593	910	2,683	(D)	(D)	30.6
Other transportation equipment.....	375-75,379	(D)	(D)	(D)	234	65	169	(D)	(D)	50.3
Aircraft and missiles.....	372,376	14,504	10,646	3,858	5,316	4,598	807	23.8	26.8	14.7
Professional and scientific instruments.....	38	1,835	71	1,764	3,341	88	3,253	55.8	33.4	56.8
Scientific and mechanical measuring instruments.....	381-82	355	0	355	1,878	81	1,798	79.4	50.0	81.5
Optical, surgical, photographic, and other instruments.....	383-87	1,480	71	1,410	1,463	7	1,456	40.3	6.8	41.3
Other manufacturing industries.....	27,31-39	277	0	277	(D)	69	(D)	15.7	15.7	15.7
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	5,994	1,326	4,668	4,115	843	3,271	22.6	22.6	31.8

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B-6. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1990

Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]										
Total.....		\$109,727	\$28,125	\$81,602	\$4,500	\$981	\$3,519	\$18,551	\$3,684	\$14,867
Food, kindred, and tobacco products.....										
20,21	(D)	1,248	125	0	(S)	(D)	336	0	336	
22,23	(D)	260	0	0	(D)	(D)	20	0	0	20
24,25	0	216	(D)	0	(D)	(D)	0	0	0	(D)
26	1,059	0	1,059	(D)	0	(D)	0	0	0	(D)
28	13,291	123	13,168	(S)	(S)	4,074	23	23	4,051	
281-82,286	5,010	109	4,902	255	(S)	(D)	(D)	(D)	1,460	
283	(D)	(D)	5,917	(S)	0	(D)	(D)	(D)	1,917	
284-85,287-89	(D)	(D)	2,349	(S)	0	(S)	(D)	(D)	(S)	
Petroleum refining and extraction.....										
Rubber products.....										
13,29	2,306	(S)	2,289	(D)	(D)	95	754	6	748	
30	(D)	(D)	1,056	40	0	(D)	(D)	(D)	77	
32	(D)	(D)	538	(D)	0	(D)	123	(D)	(D)	274
33	(D)	(D)	717	(S)	0	(S)	(S)	(S)	(S)	
331-32,3398-99	(D)	(D)	231	(D)	0	(D)	(D)	(D)	(D)	63
333-36	(D)	(D)	486	(D)	0	(D)	(D)	(D)	(D)	
Fabricated metal products.....										
Machinery.....										
34	939	203	736	30	5	(D)	25	118	(D)	
35	14,473	898	13,575	(D)	(D)	(D)	(D)	(D)	(D)	
357	(D)	(D)	10,988	(D)	(D)	(D)	(D)	(D)	(D)	
351-56,358-59	(D)	(D)	2,587	(D)	(D)	(D)	(D)	(D)	(D)	
Office, computing, and accounting machines.....										
36	13,400	4,133	9,267	376	73	(D)	303	2,631	612	2,019
365	114	0	114	(D)	0	(D)	(D)	(D)	0	(D)
366	5,928	2,344	3,584	(D)	(D)	(D)	(D)	(D)	0	2,040
367	3,914	4,118	3,496	(D)	(D)	(D)	(D)	(D)	(D)	
361-64,369	3,444	1,371	2,074	162	0	(D)	(D)	(D)	(D)	
Electrical equipment.....										
Radio and TV receiving equipment.....										
37	31,361	17,097	14,264	489	326	(D)	(D)	(D)	(D)	1,105
371	(D)	(D)	8,594	73	12	61	651	(D)	(D)	
373-75,379	(D)	(D)	283	3	1	3	(D)	(D)	(D)	
372,376	20,635	15,248	5,387	413	313	100	2,174	1,648	10	527
Other transportation equipment.....										
38	7,055	\$737	6,318	(D)	(D)	(D)	194	705	11	694
381-82	3,346	(S)	2,696	(D)	(D)	(D)	25	(D)	(D)	101
383-87	3,709	87	3,621	(D)	(D)	(D)	168	(D)	(D)	475
27,31,39	(D)	(D)	541	60	0	60	78	0	78	
4,442	16,351	1,908	1,908	553	1355	3,688	0	1,068	2,620	
Other manufacturing industries.....										
Nonmanufacturing industries.....										
50-59,60-65,67	07-10,12-17	20,793	4,442							
70-71,73,75-76	40-42,44-49									
78-79,80-81	83-84,87,89									

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1990

Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
Total.....		\$56,105	\$17,495	\$38,610	\$30,570	\$5,965	\$24,606	27.9	21.2	30.2
Food, kindred, and tobacco products.....	20,21	573	0	573	(D)	145	(D)	214	0.0	17.1
Textiles and apparel.....	22,23	88	(D)	(D)	10	135	(D)	90.9	52.1	52.1
Lumber, wood products, and furniture.....	24,25	77	0	65	0	65	0	30.1	0.0	30.1
Paper and allied products.....	26	434	0	434	426	0	426	40.3	0.0	40.3
Chemicals and allied products.....	28	5,273	28	5,246	3,232	68	3,164	24.3	55.4	24.0
Industrial chemicals.....	281-82,286	(D)	(D)	1,731	1,516	56	1,459	30.3	51.9	29.8
Drugs and medicines.....	283	(D)	(D)	2,174	1,457	12	1,446	(D)	(D)	24.4
Other chemicals.....	284-85,287-89	1,341	0	1,341	259	0	259	(D)	0.0	11.0
Petroleum refining and extraction.....	13,29	(D)	(D)	806	645	5	640	27.9	27.3	28.0
Rubber products.....	30	(D)	(D)	252	687	0	687	(D)	(D)	65.1
Stone, clay, and glass products.....	32	(D)	(D)	155	48	62	51	(D)	75.3	9.5
Primary metals.....	33	297	(D)	(D)	178	4	174	(D)	(D)	24.3
Ferrous metals and products.....	331-32,3398-99	60	(D)	(D)	109	2	107	(D)	(D)	46.3
Nonferrous metals and products.....	333-36	(S)	(D)	(D)	69	1	68	(D)	(D)	14.1
Fabricated metal products.....	34	339	(D)	(D)	451	119	332	48.1	58.6	45.2
Machinery.....	35	(D)	(D)	9,168	1,993	116	1,877	13.8	12.9	13.8
Office, computing, and accounting machines.....	357	(D)	(D)	7,736	1,154	0	1,081	(D)	0.0	9.8
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	1,431	840	42	798	(D)	(D)	30.8
Electrical equipment.....	36	6,914	2,891	4,024	3,479	557	2,922	26.0	13.5	31.5
Radio and TV receiving equipment.....	365	13	0	13	94	0	94	82.8	0.0	82.8
Communication equipment.....	366	3,831	1,721	2,110	927	98	830	15.6	4.2	23.1
Aircraft and missiles.....	367	1,478	197	1,281	1,237	62	1,175	31.6	14.8	33.6
Other electrical equipment.....	361-64,369	1,592	973	619	1,220	398	823	35.4	29.0	39.7
Transportation equipment.....	37	(D)	(D)	8,456	8,320	3,781	4,559	26.5	22.1	31.8
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	3,428	563	2,861	(D)	(D)	33.3
Other transportation equipment.....	373-5,379	(D)	(D)	3,247	255	89	166	(D)	(D)	58.6
Aircraft and missiles.....	372,376	13,411	10,163	(D)	4,637	3,124	1,513	22.5	20.5	28.1
Professional and scientific instruments.....	38	(D)	(D)	1,995	4,121	687	3,434	58.4	93.2	54.4
Scientific and mechanical measuring instruments.....	381-82	500	2	497	2,719	647	2,073	81.3	99.5	76.9
Optical, surgical, photographic, and other instruments.....	383-87	(D)	(D)	1,498	1,521	39	1,481	41.0	45.3	40.9
Other manufacturing industries.....	27,31,39	337	0	337	(D)	66	66	100.0	12.3	12.3
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 70-71, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	9,054	2,622	6,432	6,143	5,944	29.5	4.5	36.4	

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B-7. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1991

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]										
Total.....		\$116,952	\$26,372	\$90,580	\$8,584	\$2,767	\$5,817	\$22,838	\$4,595	\$18,243
Food, kindred, and tobacco products.....		20,21	1,277	0	1,277	98	0	98	417	417
Textiles and apparel.....		22,23	(D)	(D)	236	21	0	21	(D)	29
Lumber, wood products, and furniture.....		24,25	(D)	(D)	201	(D)	(D)	17	61	61
Paper and allied products.....		26	(D)	(D)	1,174	(D)	(D)	1,362	(D)	386
Chemicals and allied products.....		28	14,648	209	14,439	1,378	(S)	508	(S)	3,940
Industrial chemicals.....		281-82,286	5,390	165	5,225	(D)	(D)	732	(D)	1,110
Drugs and medicines.....		283	(D)	(D)	6,947	(D)	(D)	122	(D)	2,114
Other chemicals.....		284-85,287-89	(D)	(D)	2,267	(D)	(D)	719	(D)	716
Petroleum refining and extraction.....		13,29	2,498	11	2,487	(D)	(D)	200	(D)	725
Rubber products.....		30	(D)	(D)	(D)	(D)	(D)	237	(D)	237
Stone, clay, and glass products.....		32	(D)	(D)	455	(S)	(D)	48	(D)	154
Primary metals.....		33	714	8	706	(D)	(D)	(S)	(D)	280
Ferrous metals and products.....		331-32,3398-99	(D)	(D)	225	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....		333-36	(D)	(D)	481	(D)	(D)	(D)	(D)	(S)
Fabricated metal products.....		34	974	226	748	44	0	44	(D)	130
Machinery.....		35	14,775	1,055	13,720	(D)	(D)	315	(D)	1,752
Office, computing, and accounting machines.....		357	(D)	(D)	10,419	(D)	(D)	176	(D)	1,055
Other machinery, except electrical.....		351-56,3565-59	(D)	(D)	3,301	(D)	(D)	139	732	697
Electrical equipment.....		36	13,415	4,550	8,865	(D)	(D)	221	(D)	2,002
Radio and TV receiving equipment.....		365	102	0	102	(D)	(D)	8	(D)	8
Communication equipment.....		366	(D)	(D)	(S)	(D)	(D)	37	(D)	549
Electronic components.....		367	3,465	288	3,177	(D)	(D)	106	754	710
Other electrical equipment.....		361-64,369	(D)	(D)	2,403	(D)	(D)	70	(D)	735
Transportation equipment.....		37	27,428	12,570	14,858	503	330	173	2,288	935
Motor vehicles and motor vehicles equipment.....		373-75,379	(D)	(D)	9,063	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....		372,376	16,983	11,450	5,533	410	330	80	1,354	527
Aircraft and missiles.....										827
Professional and scientific instruments.....		38	8,705	1,865	6,840	389	(D)	(D)	(D)	(D)
Scientific and mechanical measuring instruments.....		381-82	(D)	(D)	3,017	(D)	(D)	(D)	2,027	(D)
Optical, surgical, photographic, and other instruments.....		383-87	(D)	(D)	3,823	(D)	(D)	243	(D)	680
Other manufacturing industries.....		27,31-39	(D)	(D)	22,941	(D)	(D)	5,000	(D)	(D)
Nonmanufacturing industries.....		07-10,12-17,50-59,60-65,67,701,73,75-76,78-79,80-81,83-84,87,89	28,446	5,505	2,383	2,617	6,328	1,272	(D)	5,056

See explanatory information and SOURCE at end of table.

Table B-7. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1991

Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]										
Total.....		\$65,434	\$13,961	\$51,473	\$20,096	\$5,049	\$15,047	17.2	19.1	16.6
Food, kindred, and tobacco products.....	20-21	600	0	600	162	0	162	12.7	0.0	12.7
Textiles and apparel.....	22-23	133	5	128	(D)	(D)	58	(D)	(D)	24.6
Lumber, wood products, and furniture.....	24-25	(D)	(D)	88	(D)	(D)	35	(D)	(D)	17.4
Paper and allied products.....	26	428	0	428	221	0	221	(D)	(D)	18.8
Chemicals and allied products.....	28	6,617	63	6,554	(D)	(D)	2,583	(D)	(D)	17.9
Industrial chemicals.....	281-82,286	2,673	59	2,614	(D)	(D)	993	(D)	(D)	19.0
Drugs and medicines.....	283	(D)	(D)	2,688	(D)	(D)	1,413	(D)	(D)	20.3
Other chemicals.....	284-85,287-89	(D)	(D)	1,252	(D)	(D)	177	(D)	(D)	7.8
Petroleum refining and extraction.....	13,29	957	5	952	(D)	(D)	(D)	(D)	(D)	(D)
Rubber products.....	30	(D)	(D)	407	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products.....	32	(D)	(D)	229	40	16	(D)	(D)	(D)	(D)
Primary metals.....	33	(D)	(D)	297	(D)	(D)	57	24	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	100	(D)	(D)	11	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	(D)	(D)	(S)	(D)	(D)	46	(D)	(D)	(D)
Fabricated metal products.....	34	(D)	(D)	449	(D)	(D)	125	(D)	(D)	(D)
Machinery.....	35	(D)	(D)	9,216	(D)	(D)	2,437	(D)	(D)	(D)
Office, computing, and accounting machines.....	357	(D)	(D)	7,101	(D)	(D)	2,087	(D)	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	2,225	110	2,115	364	14	350	(D)	(D)	(D)
Electrical equipment.....	36	7,258	2,665	4,593	2,571	4	0	2,049	19.2	11.5
Radio and TV receiving equipment.....	365	82	0	82	(D)	(D)	4	(D)	(D)	(D)
Communication equipment.....	366	(D)	(D)	1,401	(D)	(D)	1,196	(D)	(D)	(D)
Electronic components.....	367	(D)	(D)	2,036	(D)	(D)	325	(D)	(D)	(D)
Other electrical equipment.....	361-64,369	(D)	(D)	1,074	(D)	(D)	524	(D)	(D)	(D)
Transportation equipment.....	37	17,324	(S)	10,086	7,313	4,067	3,246	26.7	32.4	21.8
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(S)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles..	372,376	10,545	(S)	4,012	4,674	4,060	614	27.5	35.5	11.1
Professional and scientific instruments.....	38	4,508	1,160	3,348	(D)	(D)	1,458	(D)	(D)	0
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	1,282	(D)	(D)	624	(D)	(D)	20.7
Optical, surgical, photographic, and other instruments.....	383-87	(D)	(D)	2,066	(D)	(D)	834	(D)	(D)	21.8
Other manufacturing industries.....	27,31,39	387	60	327	(D)	(D)	40	(D)	(D)	(D)
Nonmanufacturing industries.....	07-10,12-17	15,620	1,849	13,771	1,498	1	1,497	5.3	0.0	6.5

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B-8. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1992

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]										
Total.....		\$121,314	\$24,660	\$96,654	\$8,443	\$2,584	\$5,859	\$22,791	\$4,194	\$18,597
Food, kindred, and tobacco products.....	20,21	1,411	0	1,411	108	0	108	430	0	430
Textiles and apparel.....	22,23	277	(S)	259	(D)	(D)	24	(D)	0	28
Lumber, wood products, and furniture.....	24,25	(D)	(D)	1,191	(D)	(D)	59	(D)	0	59
Paper and allied products.....	26	16,711	(S)	16,420	1,622	5	1,618	(D)	(D)	441
Chemicals and allied products.....	28	5,406	(S)	5,152	(D)	534	(D)	(D)	(D)	4,404
Industrial chemicals.....	281-82,286	8,831	(S)	8,822	926	1	925	(D)	(D)	1,098
Other chemicals.....	283	2,474	(S)	2,447	(D)	159	(D)	(D)	(D)	2,510
Petroleum refining and extraction.....	284-85,287-89	2,339	9	2,330	(D)	(D)	180	795	0	795
Rubber products.....	30	(D)	(D)	1,337	(S)	(D)	(S)	161	0	161
Stone, clay, and glass products.....	32	(D)	(D)	479	(D)	(D)	40	(D)	(D)	168
Primary metals.....	33	555	(S)	542	(D)	(D)	30	(D)	(D)	216
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	224	(D)	0	9	98	0	98
Nonferrous metals and products.....	333-36	(D)	(D)	318	21	21	125	(S)	(S)	118
Fabricated metal products.....	34	1,057	293	764	(D)	(D)	47	(D)	(D)	131
Machinery.....	35	15,135	1,062	14,073	(D)	(D)	609	(D)	(D)	1,516
Office, computing, and accounting machines.....	357	(D)	(D)	10,650	(D)	(D)	457	(D)	(D)	749
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	3,423	(D)	(D)	152	(D)	22	767
Electrical equipment.....	36	13,546	3,857	9,699	(D)	(D)	286	(D)	(D)	2,141
Radio and TV receiving equipment.....	365	(D)	(D)	93	(D)	(D)	(D)	(D)	(D)	(D)
Communication equipment.....	366	(D)	(D)	3,465	(D)	(D)	50	(D)	(D)	478
Electronic components.....	367	3,678	250	3,428	(D)	(D)	(D)	(D)	(D)	883
Other electrical equipment.....	361-64,369	(D)	(D)	2,733	(D)	(D)	114	(D)	(D)	(D)
Transportation equipment.....	37	26,484	10,758	15,726	444	306	138	1,948	797	1,151
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	(D)	63	63	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	9,871	6,248	21	0	21	1,439	685
Aircraft and missiles.....	372,376	16,119	9,871	6,248	360	0	54	754	754	685
Professional and scientific instruments.....	38	9,652	2,226	7,426	415	9	407	2,111	366	1,745
Scientific and mechanical measuring instruments.....	381-82	5,256	2,148	3,108	(D)	137	(D)	(D)	(D)	1,008
Optical, surgical, photographic, and other instruments.....	383-87	4,396	78	4,318	(D)	(D)	270	(D)	(D)	737
Other manufacturing industries.....	27,31,39	(D)	(D)	5,892	24,211	4,237	2,226	(D)	(D)	89
Nonmanufacturing industries.....	07-10,12-17, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	30,103	(D)	5,892	24,211	4,237	2,011	(D)	(D)	5,122

See explanatory information and SOURCE at end of table.

Table B-8. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source funds: 1992

Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]										
Total.....		\$69,504	\$13,683	\$55,821	\$20,576	\$4,199	\$16,377	17.0	17.0	17.0
Food, kindred, and tobacco products.....	20-21	706	0	706	167	0	167	11.8	0	11.8
Textiles and apparel.....	22-23	142	4	(D)	33	0	69	(D)	(D)	26.6
Lumber, wood products, and furniture.....	24-25	(D)	0	(D)	211	0	211	(D)	(D)	0.0
Paper and allied products.....	26	(D)	42	7,206	3,420	0	227	3,193	(D)	17.7
Chemicals and allied products.....	28	7,248	40	2,701	(D)	819	20.5	(S)	(D)	19.4
Industrial chemicals.....	281-82,286	2,742	40	(D)	3,190	(D)	2,197	(D)	(D)	15.9
Drugs and medicines.....	283	(D)	(D)	(D)	1,315	(D)	177	(D)	(D)	24.9
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	785	(D)	570	(D)	(D)	7.2
Petroleum refining and extraction.....	13-29	(D)	(D)	(D)	578	473	473	(D)	(D)	24.5
Rubber products.....	30	(D)	(D)	(D)	250	21	21	(D)	(D)	35.4
Stone, clay, and glass products.....	32	(D)	(D)	(D)	247	(D)	49	(D)	(D)	4.4
Primary metals.....	33	248	2	(D)	102	(D)	(D)	(D)	(D)	9.0
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	145	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Fabricated metal products.....	34	681	228	454	(D)	(D)	132	(D)	(D)	17.3
Machinery.....	35	10,017	598	9,429	2,548	24	2,519	16.8	2,3	17.9
Office, computing, and accounting machines.....	357	(D)	(D)	(D)	7,193	(D)	(D)	(D)	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	(D)	2,236	(D)	(D)	(D)	(D)	(D)
Electrical equipment.....	36	7,569	2,305	5,263	2,521	524	1,999	18.6	13.6	20.6
Radio and TV receiving equipment.....	365	(D)	(D)	(D)	72	(D)	(D)	(D)	(D)	(D)
Communication equipment.....	366	(D)	(D)	(D)	1,719	(D)	(D)	(D)	(D)	(D)
Electronic components.....	367	2,421	163	2,257	(D)	(D)	(D)	(D)	(D)	19.1
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	1,215	(D)	521	(D)	(D)	(D)
Transportation equipment.....	37	17,936	6,930	11,006	6,156	2,725	3,431	23.2	25.3	21.8
Motor vehicles and motor vehicles' equipment.....	371	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	11,177	6,095	5,082	3,143	2,716	427	19.5	27.5	6.8
Professional and scientific instruments.....	38	5,161	1,430	3,731	1,965	420	1,543	20.4	18.9	20.8
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	(D)	1,360	(D)	(D)	(D)	(D)	19.4
Optical, surgical, photographic, and other instruments.....	383-87	(D)	(D)	(D)	2,371	(D)	(D)	(D)	(D)	21.8
Other manufacturing industries.....	27,31,39	(D)	(D)	(D)	380	38	0	38	(D)	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	17,187	2,038	15,149	2,128	199	199	1,929	3.4	8.0

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B-9. Unit response rates--Number of companies responding to survey, by industry: 1992

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Industry	SIC code	Number of companies receiving form	Response rate [Percent]
Total.....		23,166	84.0
Distribution by industry			
Food, kindred, and tobacco products	20,21	381	82.9
Textiles and apparel.....	22,23	651	80.0
Lumber, wood products, and furniture.....	24,25	1,759	81.0
Paper and allied products.....	26	224	87.5
Chemicals and allied products.....	28	565	85.5
Industrial chemicals.....	281-82,286	103	84.4
Drugs and medicines.....	283	100	84.0
Other chemicals.....	284-85,287-89	362	86.2
Petroleum refining and extraction.....	13,29	925	83.0
Rubber products.....	30	263	84.4
Stone, clay, and glass products.....	32	409	82.9
Primary metals.....	33	596	85.1
Ferrous metals and products.....	331-32,3398-99	328	87.8
Nonferrous metals and products.....	333-36	268	81.7
Fabricated metal products.....	34	656	83.1
Machinery.....	35	1,731	85.2
Office, computing, and accounting machines.....	357	167	77.2
Other machinery, except electrical.....	351-56,358-59	1,564	86.0
Electrical equipment.....	36	1,463	82.0
Radio and TV receiving equipment.....	365	54	81.5
Communication equipment.....	366	323	81.4
Electronic components.....	367	634	81.9
Other electrical equipment.....	361-64,369	452	82.5
Transportation equipment.....	37	298	87.2
Motor vehicles and motor vehicles equipment.....	371	93	84.9
Other transportation equipment.....	373-75,379	98	92.9
Aircraft and missiles.....	372,376	107	84.1
Professional and scientific instruments.....	38	824	82.3
Scientific and mechanical measuring instruments.....	381-82	388	84.8
Optical, surgical, photographic, and other instruments.....	384-87	436	80.0
Other manufacturing industries	27,31,39	1,018	82.9
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	11,405	84.9

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B-10. Item response rates--Percent of companies responding to selected items: 1992

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Data Item	Percent
Sales	93.8
Total Employment	95.4
Scientists and Engineers	76.7
Federal R&D	90.5
Company R&D	1/
Total R&D	95.6

1/ Item response for "Federal R&D" and for "Company R&D" are considered together; companies that report "Total R&D" and either of these expenditures implicitly report both company and Federal R&D, since these two items sum to total R&D.

NOTE: These data represent response rates for specific items for companies with known R&D expenditures. Companies without R&D expenditures or with unknown R&D expenditures are not included in these figures.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

intervening years a panel of the largest firms known to perform R&D was surveyed. For example, a sample of about 14,000 firms was selected for the 1987 survey. For the 1988 through 1991 studies, about 1,700 of these firms were annually resurveyed; the other firms did not receive another questionnaire, and their R&D data were estimated. This sample design was adequate during the early years of the survey because the performance of R&D remained concentrated in the manufacturing industries. However, as more and more firms began entering the R&D performing arena, the old sample design proved increasingly deficient because it did not capture births of new R&D performing firms; the entry of fledgling R&D performers into the marketplace simply was missed during panel years. Additionally, beginning in the early 1970s, the need for more detailed R&D information for nonmanufacturers was recognized. At that time, statistics for the broad industry classifications "miscellaneous business services" and "miscellaneous services" were added to the list of industry groups for which statistics were published. By 1975 about 3 percent of total R&D was performed by firms in nonmanufacturing industries.

During the mid-1980s there was evidence that an increasing number of nonmanufacturing firms were conducting a significant amount of R&D, and again the number of industries used to develop the statistics for nonmanufacturers was increased. Consequently, the annual reports in this series for 1987 and since have included separate R&D estimates for firms in the communication, utility, engineering, architectural, research, development, testing, computer programming, and data processing service industries; hospitals; and medical labs. Approximately 9 percent of the estimated industrial R&D performance during 1987 was undertaken by nonmanufacturing firms.

In addition to adding to the list of industries for which statistics were published, it became clear from these observations that the sample design itself should be changed to reflect the widening population of R&D performers among firms in the nonmanufacturing industries and small firms in all industries, to account better for births of R&D performing firms and to produce statistics that are generally more reliable. So, beginning with the 1992 survey, NSF decided to (1) draw new samples with broader coverage annually and (2) increase the sample size to approximately

23,000 firms.¹⁶ As a result of the sample redesign, for 1992 the reported nonmanufacturing share was estimated to be 25 percent of total R&D.¹⁷

Revisions to Immediate Prior-Year Statistics

As has been the practice throughout the history of the survey, results from the current-year survey are used not only to develop current-year statistics, but also to revise immediate prior-year statistics. Differences between originally developed statistics and revised statistics occur for three reasons: industry shifts, data revisions, and, of particular importance in the discussion of the 1992 survey results, the effects of a new sample. Table B-11 quantifies these effects for each industry and industry grouping.

Industry shifts. The movement of a company from one industry into another can be caused by several factors: changes in a company's payroll composition, which is used to determine the industry classification code (see discussion above under "Frame Creation"), changes in the industry classification system itself, and changes in the way the industry classification code is assigned or revised during survey processing. These are described below.

Payroll composition. A company's payroll composition changes because of a number of events. Among them are (1) the growth or decline of product

¹⁶ Annual sampling also will remedy the cyclical deterioration of the statistics that results from changes in a company's payroll composition because of product line and corporate structural changes.

¹⁷ For the 1992 survey, 25 new nonmanufacturing industry and industry groups were added to the sample frame: agricultural services (SIC 07); fishing, hunting, and trapping (09); wholesale trade-nondurables (51); stationery and office supply stores (5112); industrial and personal service paper (5113); groceries and related products (514); chemicals and allied products (516); miscellaneous nondurable goods (519); home furniture, furnishings, and equipment stores (57); radio, TV, consumer electronics, and music stores (573); eating and drinking places (581); miscellaneous retail (59); nonstore retailers (596); real estate (65); holding and other investment offices (67); hotels, rooming houses, camps and other lodging places (70); automotive repair, services, and parking (75); miscellaneous repair services (76); amusement and recreation services (79); health services (80); offices and clinics of medical doctors (801); offices and clinics of other health practitioners (804); miscellaneous health and allied services not elsewhere classified (809); engineering, accounting, research, management, and related services (87); and management, and public relations services (874).

or service lines; (2) the merger of two or more companies; (3) the acquisition of one company by another; (4) divestitures; or (5) the formation of conglomerates. With annual sampling, when it is determined that a company's payroll composition—and therefore its industry classification—has changed, the company's data are reclassified into the new industry beginning in the year of the change. Prior to annual sampling, firms were not subject to annual reclassification. Most of the shifts in R&D performance between industries detailed in table B-11 undoubtedly stemmed from changes in companies' payroll composition.

Industry classification system. From time to time the standard industrial classification (SIC) coding system, which is used by most Federal Government agencies that publish industry statistics, is revised to reflect the changing composition of U.S. industry. For statistics developed for 1988-91 from the 1988-91 surveys, companies retained the industry classifications assigned for the 1987 sample. These classifications were based on the 1977 SIC system. The last major revision of the SIC system was for 1987, so this new system was used to classify companies in the 1992 survey. Consequently, the 1992 statistics and revised 1991 statistics in this report were developed using the 1987 SIC system and minor data shifts are attributable to the system change. For example, the 1987 system expanded SIC 30, rubber products, to include a variety of specific plastic products that may have been classified elsewhere using the 1977 system.

Processing changes. Finally, in response to perceived changes in the amount and dispersion of R&D among industries and findings of various quality improvement initiatives and other research undertakings, the sponsor of the survey, in consultation with the compiling agent, from time to time seeks to improve the coverage of the survey by revising the method used to classify firms. Research has shown that there is no impact on the aggregated statistics because of these processing changes and the impact on individual industry estimates is minor.¹⁸ The

¹⁸ The effects of recent changes in the way companies are classified during survey processing are discussed in detail in a Bureau of the Census technical memorandum entitled "Reclassification of Companies in the 1992 Survey of Industrial Research and Development for the Generation of the 'Analytical' Series" Oct. 25, 1994.

current method used to classify firms is discussed above under "Frame Creation." Methods used for past surveys are discussed in the technical paper cited below.¹⁹

As table B-11 shows, in the aggregate, industry shifts had no effect on the revised 1991 estimate of total R&D. However, the effects are evident among the industry groupings. Most affected were statistics for the electrical equipment (SIC 36), transportation equipment (SIC 37), and nonmanufacturing industries. Approximately \$6.9 billion of R&D previously reported for manufacturing industries was shifted to nonmanufacturing industries in the revised 1991 statistics.

Data revisions. Changes to reported data can come from two sources: from respondents (see discussion above under "Survey Questionnaires") and from analysts involved in survey and statistical processing. Respondents from companies that were in both the 1991 and 1992 surveys may have revised previously reported data for 1991. Analysts, while performing followup, may have corrected incorrectly reported or supplied missing 1991 data. Data revisions accounted for \$1.0 billion or 6.8 percent of the \$14.7 billion revision to the 1991 estimate of total R&D.

Sample design. Changes to the sample design can dramatically affect revisions to immediate prior-year estimates. By far the most profound influence on the revisions to the 1991 statistics was the new sample design. It accounted for \$13.7 billion or 93.2 percent of the \$14.7 billion revision to total R&D with most of this amount (\$11.4 billion) attributable to the wider sampling of the nonmanufacturing industries.²⁰

To summarize, differences between originally published and revised 1991 statistics stem from industry shifts, data revisions, and the new sample. Of the three, the new sample had the largest effect

¹⁹ U.S. Department of Commerce, Bureau of the Census, *Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

²⁰ Of the \$11.4 billion increase in the revised 1991 nonmanufacturing R&D total, the 25 industry groups newly added to the survey frame accounted for over \$2.0 billion in R&D expenditures.

Table B-11. 1991 total (company, Federal, and other) funds for industrial R&D performance from the 1991 and 1992 surveys

Industry	SIC code	Total R&D			Reasons for revision		
		1991 total R&D from 1991 survey (2)	1991 total R&D from 1992 survey (3)	Net revision to 1991 estimate (3) - (2) (4)	Industry shifts (5)	Data revisions (6)	New sample (7)
[Dollars in millions]							
Total.....		\$102,246	\$116,952	\$14,706	\$0	\$1,007	\$13,699
Food, kindred, and tobacco products	20,21	1,360	1,277	(83)	39	1	94
Textiles and apparel	22,23	(D)	(D)	(17)	(12)	17	39
Lumber, wood products, and furniture	24,25	160	(D)	(D)	(D)	(D)	49
Paper and allied products	26	715	(D)	(D)	426	(D)	(63)
Chemicals and allied products	28	13,183	14,648	1,465	710	330	425
Industrial chemicals	281-82,286	4,433	5,390	957	586	(41)	412
Drugs and medicines	283	(D)	(D)	874	266	1	607
Other chemicals	284-85,287-89	(D)	(D)	(366)	(142)	370	(594)
Petroleum refining and extraction	13,29	2,245	2,498	253	107	73	73
Rubber products	30	(D)	(D)	(D)	(352)	(337)	366
Stone, clay, and glass products	32	(D)	(D)	(D)	(122)	(130)	(23)
Primary metals	33	836	714	(19)	(28)	(5)	13
Ferrous metals and products	331-32,3398-99	(D)	(D)	(D)	(103)	(102)	(6)
Nonferrous metals and products	333-36	(D)	(D)	(D)	(D)	5	150
Fabricated metal products.....	34	756	974	218	8	61	(815)
Machinery	35	15,089	14,775	(314)	7	494	(481)
Office, computing, and accounting machines	357	11,433	11,309	(124)	(62)	75	(334)
Other machinery, except electrical	351-56,388-59	3,656	3,466	(190)	(69)	(4,662)	268
Electrical equipment	36	17,279	13,415	(3,864)	(4,662)	268	530
Radio and TV receiving equipment	365	78	(D)	(D)	(5,657)	(D)	19
Communication equipment	366	10,444	4,787	(2,133)	(2,133)	158	108
Electronic components	367	5,321	(D)	(D)	3,391	(D)	200
Other electrical equipment	361-64,389	1,436	(D)	(D)	(4,663)	(3,877)	194
Transportation equipment	37	32,091	27,428	(882)	(882)	96	367
Motor vehicles and motor vehicles equipment	371	(D)	(D)	372	2	3	37
Other transportation equipment	373-75,379	(D)	(D)	28	(3,857)	(898)	(308)
Aircraft and missiles	372,376	21,692	16,629	(5,063)			

See explanatory information and SOURCE at end of table.

Table B-11. 1991 total (company, Federal, and other) funds for industrial R&D performance from the 1991 and 1992 surveys

Industry	SIC code	Total R&D			Reasons for revision		
		1991 total R&D from 1991 survey (2)	1991 total R&D from 1992 survey (3)	Net revision to 1991 estimate (3) - (2) (4)	Industry shifts (5)	Data revisions (6)	New sample (7)
[Dollars in millions]							
Professional and scientific instruments	38	\$6,621	\$8,705	\$2,084	\$1,100	\$93	\$891
Scientific and mechanical measuring instruments	381-82	2,150	(D)	(D)	2,154	(D)	467
Optical, surgical, photographic, and other instruments	383-87	4,471	(D)	(D)	(1,054)	(D)	422
Other manufacturing industries	27,31,39	9,642	(D)	(D)	149	(86)	207
Nonmanufacturing industries	10-11,14-17,40-42,44-51,53-54,56,60,62-63,72-73,78,80-07,87	28,446	18,804	18,804	6,935	448	11,421

1/ The difference between the two sets of 1991 estimates can be accounted for by companies that have switched industries (column 5), companies that have revised their data (column 6), and sampling variation (column 7).

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

because it included a larger number of industries, especially among nonmanufacturing classifications, and potentially a larger number of firms, especially small firms, in all classifications. Comparing the 1991 panel and the 1992 sample, the sample reflected changes in the universe that could not be accounted for by the panel. The frame for the sample included industries that were not represented previously under the assumption that companies in those industries contributed little or no R&D activity.²¹ Further, data for small R&D performers were imputed for the panel years and used in the original 1991 statistics. The revised 1991 estimates from the 1992 survey included actually reported data for many more small companies.

Linking Current-Year Statistics with Statistics from Previous Surveys

Time Series Analyses

As discussed earlier, the statistics resulting from the survey are better indicators of changes in, rather than absolute levels of, R&D spending and personnel. Nevertheless, the statistics are often considered as a continuous time series that has been prepared using the same collection, processing, and tabulation methods. Such uniformity of preparation has not been the case. Since the survey was first fielded, improvements have been made to increase the reliability of the statistics and to make the survey results more useful. To that end, existing practices have been changed and new procedures have been instituted. Preservation of the comparability of the statistics has been an important consideration when improvements have been made, however. Changes to survey definitions, the industry classification system, and the procedure used to assign industry codes to multiestablishment companies²² have had some, though not substantial, effects on the comparability of statistics.²³ The aspect of the

survey that had a greater effect on comparability was the selection of samples at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987, 1992) and the use of a subset or panel of the last sample drawn to develop statistics for intervening years. As discussed above, this practice introduced cyclical deterioration of the statistics.

To compensate for this deterioration, periodic revisions have been made to the statistics produced from the panels surveyed between sample years. Early in the survey's history, various methods were used to make these revisions.²⁴ Since 1976, a linking procedure called "wedging" has been used.²⁵ Simply described, in wedging the 2 sample years on each end of a series of estimates serve as benchmarks in the algorithms used to adjust the estimates for the intervening years.

Wedging Methodology

For a full discussion of the mathematical algorithm used for the wedging process that linked statistics from the 1992 survey with those from the 1987 survey, see the technical memorandum cited below.²⁶ In general, the memorandum states that wedging—

takes full advantage of the fact that in the first year of a new panel [when a new sample is selected], both current year and prior-year estimates are derived. Thus, two independent estimates exist for the prior year. The estimates from the new panel are treated as superior primarily because the new panel is based on updated classifications [the industry classifications in the prior panel are frozen] and is more fully representative of the current universe (the prior panel suffers from panel deterioration, especially a lack of birth updating). The limitations in the prior panel

²¹ That assumption could not be verified, nor an informed change made to it, because these companies were not surveyed in panel years.

²² For discussions of each of these, see the Bureau of the Census technical memorandum entitled "Wedging Considerations for the 1992 Research and Development (R&D) Survey," June 10, 1994.

²³ See the Bureau of the Census technical memoranda entitled "Reclassification of Companies in the 1992 Survey of Industrial Research and Development (R&D) for the Generation of the 'Analytical' Series," Oct. 25, 1994 and "Effects of the 1987 SIC Revision on Company Classification in the Survey of Industrial Research and Development (R&D)," Dec. 6, 1993.

²⁴ See U.S. Department of Commerce, Bureau of the Census, *Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

²⁵ The process was dubbed "wedging" because of the wedgelike area produced on a graph that compares originally reported statistics with the revised statistics that result after linking.

²⁶ Bureau of the Census technical memorandum, "Wedging Considerations for the 1992 Research and Development (R&D) Survey," June 10, 1994.

caused by these factors are naturally assumed to increase with time, so that in the revised series, we desire a gradual increase in the level or revision over time which culminates in the real difference observed between the two independent sample estimates of the prior year. At the same time, we desire that the annual movement of the original series be preserved to the degree possible in the revised series.

To that end, the wedging algorithm does not change estimates from sample years and adjusts estimates from panel years, recognizing that deterioration of the panel is progressive over time.

Wedged Versus Not-Wedged Statistics

One of the primary reasons for the decision to select a new sample annually rather than at irregular intervals was to avoid the necessity to apply global revision processes like wedging. Consequently, the 1992 survey is intended to be the last one for which wedging is an issue. For users who are interested, 18 of the detailed statistical tables in section A are reproduced below. Tables N-1 through N-18 are identical to the

section A tables except that they contain statistics that are not wedged for 1988-90.

Revisions to Historical Statistics

Throughout the history of the survey, during regular survey processing, all immediate prior-year statistics have been subject to revision with results from the current year's survey. Changes to older statistics, however, usually have been limited to revisions because of changes in the industry classification of companies caused by changes in payroll composition detected when a new sample was drawn. Various methodologies have been adopted over the years to revise, or backcast, the data when revisions to historical statistics have become necessary.

Documented revisions to the historical statistics from post-1967 surveys are summarized in *Research and Development in Industry: 1991* (NSF 94-325). Detailed descriptions of the specific revisions made to the statistics from pre-1967 surveys are scarce. However, summaries of some of the major revisions are included in the technical paper cited below.²⁷

²⁷ U.S. Department of Commerce, Bureau of the Census, *Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995)

Table N-1. Trends in industrial R&D performance, by source of funds: 1953-92

[Dollars in millions]

Page 1 of 1

Year	Total R&D		Federal		Company 1/	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
1953.....	\$3,630	\$16,500	\$1,430	\$6,500	\$2,200	\$10,000
1954.....	4,070	18,333	1,750	7,883	2,320	10,450
1955.....	4,640	20,262	2,180	9,520	2,460	10,742
1956.....	6,605	27,987	3,328	14,102	3,277	13,886
1957.....	7,731	31,684	4,335	17,766	3,396	13,918
1958.....	8,389	33,691	4,759	19,112	3,630	14,578
1959.....	9,618	37,570	5,635	22,012	3,983	15,559
1960.....	10,509	40,419	6,081	23,388	4,428	17,031
1961.....	10,908	41,475	6,240	23,726	4,668	17,749
1962.....	11,464	42,617	6,434	23,918	5,029	18,695
1963.....	12,630	46,434	7,270	26,728	5,360	19,706
1964.....	13,512	48,780	7,720	27,870	5,792	20,910
1965.....	14,185	49,947	7,740	27,254	6,445	22,694
1966.....	15,548	52,884	8,332	28,340	7,216	24,544
1967.....	16,385	54,076	8,365	27,607	8,020	26,469
1968.....	17,429	54,808	8,560	26,918	8,869	27,890
1969.....	18,308	54,814	8,451	25,302	9,857	29,512
1970.....	18,067	51,327	7,779	22,099	10,288	29,227
1971.....	18,320	49,380	7,666	20,663	10,654	28,717
1972.....	19,552	50,392	8,017	20,662	11,535	29,729
1973.....	21,249	51,450	8,145	19,722	13,104	31,729
1974.....	22,887	50,973	8,220	18,307	14,667	32,666
1975.....	24,187	49,161	8,605	17,490	15,582	31,671
1976.....	26,997	51,620	9,561	18,281	17,436	33,338
1977.....	29,825	53,354	10,485	18,757	19,340	34,597
1978.....	33,304	55,231	11,189	18,556	22,115	36,675
1979.....	38,226	58,271	12,518	19,082	25,708	39,189
1980.....	44,505	62,071	14,029	19,566	30,476	42,505
1981.....	51,810	65,665	16,382	20,763	35,428	44,902
1982.....	58,650	69,988	18,545	22,130	40,105	47,858
1983.....	65,268	74,849	20,680	23,716	44,588	51,133
1984.....	74,800	82,198	23,396	25,710	51,404	56,488
1985.....	84,239	89,236	27,196	28,809	57,043	60,427
1986.....	87,823	90,633	27,891	28,783	59,932	61,849
1987.....	92,155	92,155	30,752	30,752	61,403	61,403
1988.....	97,889	94,215	32,117	30,911	65,772	63,303
1989.....	101,854	93,875	31,292	28,841	70,562	65,034
1990.....	104,606	92,327	30,626	27,031	73,980	65,296
1991.....	116,952	99,449	26,372	22,425	90,580	77,024
1992.....	121,314	100,342	24,660	20,397	96,654	79,945

1/ Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

NOTE: 1987 gross domestic product implicit price deflators were used to convert current dollars to constant dollars.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-2. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
[Dollars in millions]												
Total.....												
Distribution by industry												
Food, kindred, and tobacco products 1/.....												
20,21 Textiles and apparel.....												
22,23 Lumber, wood products, and furniture.....												
24,25 Paper and allied products.....												
26 Chemicals and allied products.....												
28 Industrial chemicals.....												
281-82,286 Drugs and medicines.....												
283 Other chemicals.....												
284-85,287-89 Petroleum refining and extraction.....												
30 Rubber products.....												
32 Stone, clay, and glass products.....												
33 Primary metals.....												
13,29 Ferrous metals and products.....												
30 Nonferrous metals and products.....												
32 Fabricated metal products.....												
33 Machinery.....												
34 Office, computing, and accounting machines.....												
35 Other machinery, except electrical.....												
36 Electrical equipment.....												
365 Radio and TV receiving equipment.....												
366 Communication equipment.....												
367 Electronic components.....												
361-64,369 Other electrical equipment.....												
37 Transportation equipment.....												
371 Motor vehicles and motor vehicles' equipment.....												
373-75,379 Other transportation equipment.....												
372,376 Aircraft and missiles.....												

See explanatory information and SOURCE at end of table.

Table N-2. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
[Dollars in millions]												
Distribution by industry												
Professional and scientific instruments.....	38	\$3,930	\$4,266	\$4,602	\$5,013	\$5,103	\$5,222	\$5,426	\$5,743	\$6,194	\$6,705	\$9,652
Scientific and mechanical measuring instruments, Optical surgical, photographic, and other instruments.....	381-82	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1,734	1,868	2,096	(D)
384-87	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	3,692	3,875	4,098	(D)
Other manufacturing industries 1/.....	27,31,39	(D)	(D)	(D)	(D)	6,714	7,446	7,844	(D)	(D)	(D)	(D)
Nonmanufacturing industries 2/.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	3,337	2,472	4,905					8,113	8,286	9,274	28,446
Distribution by size of company [Based on number of employees]												
Total.....	\$58,650	\$65,268	\$74,800	\$84,239	\$87,823	\$92,155	\$97,889	\$101,854	\$104,606	\$116,952	\$121,314	
Fewer than 500 3/.....	2,934	4,422	4,402	5,866	7,071	7,163	(S)	7,620	(S)	13,172	14,496	
500 to 999 4/.....	N/A	N/A	1,439	1,648	1,902	1,725	1,656	1,765	1,976	8,000	8,410	
1,000 to 4,999.....	3,864	4,178	5,520	6,240	7,472	7,262	7,598	7,696	7,786	10,453	12,415	
5,000 to 9,999.....	3,251	2,798	4,022	4,251	4,501	5,236	5,626	6,163	8,049	8,672		
10,000 to 24,999.....	7,943	9,499	11,351	11,109	10,493	12,043	11,473	10,185	11,598	15,770	16,419	
25,000 or more.....	41,156	44,372	48,837	55,354	56,991	59,461	64,677	68,962	68,852	67,508	60,902	

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

3/ Data for 1982-83 are for companies with fewer than 1,000 employees.

4/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-3. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982-92

Page 1 of 2

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
[Dollars in millions]												
Total.....												
		\$40,105	\$44,588	\$51,404	\$57,043	\$59,932	\$61,403	\$65,772	\$70,562	\$73,980	\$90,580	\$96,654
Distribution by industry:												
Food, kindred, and tobacco products 1/.....		20,21	777	824	1,081	1,136	1,280	1,204	1,192	1,284	1,308	1,277
Textiles and apparel.....	22,23	136	150	182	218	246	243	210	172	(S)	242	236
Lumber, wood products, and furniture.....	24,25	159	152	143	147	144	137	156	183	200	193	259
Paper and allied products.....	26	566	552	594	576	538	604	664	686	730	1,174	(D)
Chemicals and allied products.....	28	6,197	6,792	7,736	8,310	8,684	9,445	10,573	11,383	12,277	14,439	1,191
Industrial chemicals.....	281-82,286	2,810	2,828	3,057	3,281	3,374	3,531	3,763	3,960	4,272	5,225	5,152
Drugs and medicines.....	283	2,473	2,896	3,310	3,481	3,657	4,095	4,743	5,164	5,366	6,947	8,822
Other chemicals.....	284-85,287-89	914	1,068	1,369	1,548	1,633	1,819	2,067	2,259	2,638	2,677	2,447
Petroleum refining and extraction.....	13,29	2,003	2,074	2,245	2,194	1,971	1,883	1,923	2,050	2,113	2,487	2,330
Rubber products.....	30	617	638	671	659	655	596	635	678	730	(D)	1,337
Stone, clay, and glass products.....	32	472	586	705	825	941	985	826	863	894	455	479
Primary metals.....	33	711	701	683	730	786	711	642	715	801	706	542
Ferrous metals and products.....	331-32,3398-99	426	396	357	323	336	249	257	254	245	225	224
Nonferrous metals and products.....	333-36	285	305	326	407	450	462	385	461	556	481	318
Fabricated metal products.....	34	565	634	773	780	800	633	687	664	644	748	764
Machinery.....	35	7,227	7,911	9,312	10,721	10,701	10,577	11,992	13,478	13,780	13,720	14,073
Office, computing, and accounting machines.....	357	4,944	5,634	7,011	8,448	8,380	8,193	9,371	10,780	11,073	10,419	10,650
Other machinery, except electrical.....	351-56,358-59	2,283	2,277	2,301	2,303	2,321	2,384	2,621	2,698	2,707	3,301	3,423
Electrical equipment.....	36	6,682	8,158	9,037	9,271	9,767	10,449	11,061	11,641	12,131	8,865	9,689
Radio and TV receiving equipment.....	365	364	324	362	350	133	139	139	84	93	(D)	93
Communication equipment.....	366	3,555	4,500	5,147	5,174	5,117	5,455	5,675	5,820	5,932	(S)	3,435
Electronic components.....	367	1,342	1,810	2,354	2,826	3,357	3,630	4,068	4,458	4,709	3,177	3,428
Other electrical equipment.....	361-64,369	1,421	1,524	1,174	921	1,160	1,225	1,179	1,279	1,397	(D)	2,733
Transportation equipment.....	37	8,621	8,991	10,406	12,092	13,567	13,462	14,162	15,083	14,992	14,858	15,726
Motor vehicles and motor vehicles equipment.....	371	4,321	4,754	5,384	6,164	7,171	7,167	7,769	8,548	9,063	(D)	(D)
Other transportation equipment.....	373-75,379	114	227	258	279	330	356	370	353	304	262	6,248
Aircraft and missiles.....	372,376	4,186	4,010	4,764	5,649	6,066	5,939	6,023	6,140	5,533	6,140	6,248

See explanatory information and SOURCE at end of table.

Table N-3. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	[Dollars in millions]									1991	1992
		1982	1983	1984	1985	1986	1987	1988	1989	1990		
Distribution by industry:												
Professional and scientific instruments.....	38	\$3,407	\$3,816	\$4,211	\$4,622	\$4,752	\$4,950	\$5,306	\$5,630	\$6,095	\$6,840	\$7,426
Scientific and mechanical measuring instruments.	381-82	1,363	1,605	1,671	1,596	1,521	1,598	1,710	1,858	2,086	3,017	3,108
Optical, surgical, photographic, and other instruments.....	384-87	2,044	2,211	2,540	3,026	3,231	3,352	3,596	3,772	4,009	3,823	4,318
Other manufacturing industries 1/.....	27,31,39	493	525	373	361	380	383	400	472	5,620	6,588	22,941
Nonmanufacturing industries 2/.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	1,472	2,084	3,252	4,401	4,740	5,144	5,360	(D)	(D)	(D)	24,211
Distribution by size of company [Based on number of employees]												
Total.....	\$40,105	\$44,588	\$51,404	\$57,043	\$59,932	\$61,403	\$65,772	\$70,562	\$73,980	\$90,580	\$96,654	
Fewer than 500 3/.....	2,411	3,781	5,127	6,203	6,200	(S)	(S)	(S)	(S)	(S)	(S)	
500 to 999 4/.....	N/A	N/A	1,341	1,531	1,765	1,610	1,517	1,660	1,836	7,819	12,381	
1,000 to 4,999.....	3,241	3,438	4,618	5,249	6,243	6,281	6,441	6,646	6,827	9,403	8,232	
5,000 to 9,999.....	2,224	2,080	2,764	3,350	3,455	3,753	4,322	4,815	5,883	7,233	11,259	
10,000 to 24,999.....	6,448	7,228	8,556	8,366	8,489	9,681	9,668	8,948	9,936	12,397	7,821	
25,000 or more.....	25,781	28,061	30,354	33,421	33,778	33,878	37,438	41,860	42,242	42,443	44,001	

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

3/ Data for 1982-83 are for companies with fewer than 1,000 employees.

4/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

NOTE: Company funds include all funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and State governments. Company-financed R&D not performed within the company is excluded.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-4. Company-financed R&D performed outside the United States by U.S. domestic companies and their foreign subsidiaries, by selected industry: 1982-92

Industry	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
[Dollars in millions]												
Total		\$3,094	\$3,269	\$3,633	\$3,650	\$4,624	\$5,226	\$6,295	\$6,814	\$7,727	\$9,147	\$9,981
Food, kindred, and tobacco products 1/	20,21	64	63	70	75	69	37	27	41	40	66	68
Chemicals and allied products	28	682	729	786	843	1,071	1,243	1,501	1,504	1,980	2,401	2,683
Industrial and other chemicals	281-32,284-89	319	368	385	444	579	625	781	508	547	1,009	1,042
Drugs and medicines	283	363	361	401	399	492	618	720	996	1,443	1,392	1,641
Petroleum refining and extraction	13,29	133	103	101	47	40	47	58	45	71	107	119
Stone, clay, and glass products	32	10	19	60	(D)	(D)	(D)	(D)	(D)	263	38	41
Primary metals	33	9	10	9	(D)	(D)	18	24	26	30	20	20
Fabricated metal products	34	25	23	21	21	21	26	40	(D)	46	65	86
Machinery	35	494	577	740	689	951	1,233	1,364	1,515	1,580	1,476	1,450
Electrical equipment	36	467	482	537	591	(S)	432	669	574	671	651	554
Radio and TV receiving equipment	365	(T)	(T)	(D)	(D)	(D)	0	(D)	(D)	(D)	2	(D)
Communication equipment	366	38	(T)	(D)	(D)	(D)	189	339	271	278	151	180
Electronic components	367	43	38	30	24	24	150	204	278	204	266	169
Other electrical equipment	361-64,369	43	38	30	24	25	39	(D)	(D)	(D)	334	(D)
Transportation equipment	37	843	880	907	1,025	(D)	(D)	1,801	(D)	(D)	2,402	(D)
Motor vehicles and other transportation equipment	371,373-75,379	(T)	(T)	(D)	(D)	(D)	(D)	1,469	(D)	(D)	2,166	(D)
Aircraft and missiles	372,376	(T)	(T)	(D)	(D)	182	237	332	614	277	236	406
Professional and scientific instruments	38	237	(T)	263	169	212	317	393	449	563	656	700
Other manufacturing industries 1/	22-27,30-31,39	123	92	131	125	141	138	145	179	467	(D)	(D)
Nonmanufacturing industries 2/	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	7	10	8	18	27	64	95	108	114	778	860

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 80-87, and 87.

NOTE: Data are reported in current U.S. dollars.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
(T) = Data not separately available, but are included in total.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-5. Federal funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
[Dollars in millions]												
Page 1 of 2												
Total.....		\$18,545	\$20,680	\$23,396	\$27,196	\$27,891	\$30,752	\$32,117	\$31,292	\$30,626	\$26,372	\$24,660
Distribution by industry												
Food, kindred, and tobacco products 1/.....	20,21	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0
Textiles and apparel.....	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)
Lumber, wood products, and furniture.....	24,25	0	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Paper and allied products.....	26	0	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)
Chemicals and allied products.....	28	407	393	191	230	179	190	199	83	67	209	(S)
Industrial chemicals.....	281-82,286	386	386	183	217	178	185	196	79	65	165	(S)
Drugs and medicines.....	283	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	0	(D)	(S)
Petroleum refining and extraction.....	13,29	(D)	(D)	(D)	(D)	(D)	(D)	(D)	14	21	(S)	(S)
Rubber products.....	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	10	10	(D)	(D)
Stone, clay, and glass products.....	32	(D)	(D)	(D)	(D)	(D)	(D)	(D)	9	10	(D)	(D)
Primary metals.....	33	276	384	(D)	(D)	(D)	(D)	(D)	19	21	34	(D)
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1	1	(D)	(D)
Nonferrous metals and products.....	333-36	(D)	(D)	(D)	(D)	(D)	(D)	(D)	8	20	(D)	(D)
Fabricated metal products.....	34	60	67	69	49	95	150	142	135	134	226	(D)
Machinery.....	35	851	1,116	1,192	1,495	(D)	(D)	(D)	(D)	(D)	916	1,055
Office, computing, and accounting machines.....	351-56,358-59	(D)	(D)	(D)	(D)	(D)	(D)	(D)	75	44	(D)	(D)
Other machinery, except electrical.....	361-64,369	(D)	(D)	(D)	(D)	(D)	(D)	(D)	98	98	(D)	(D)
Electrical equipment.....	36	4,241	4,523	4,741	5,161	5,213	5,399	5,181	5,288	5,592	4,550	3,857
Radio and TV receiving equipment.....	365	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	0	0	(D)
Communication equipment.....	366	2,284	2,798	3,538	4,223	4,552	4,729	4,621	4,719	4,838	(D)	(D)
Electronic components.....	367	398	359	477	559	(D)	(D)	656	539	532	723	250
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	(D)	(D)	(D)	14	21	37	31	(D)
Transportation equipment.....	37	(D)	(D)	(D)	(D)	(D)	(D)	17,708	20,784	22,176	21,761	12,570
Motor vehicles and motor vehicles equipment.....	371	476	564	673	820	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	14,094	16,582	14,984	18,519	19,877
Aircraft and missiles.....	372,376	10,265	11,396	14,094	16,582	(D)	(D)	(D)	(D)	(D)	19,633	19,216

See explanatory information and SOURCE at end of table.

Table N-5. Federal funds for industrial R&D performance, by industry and size of company: 1982-92

Industry and size of company	SIC code	[Dollars in millions]							1992
		1982	1983	1984	1985	1986	1987	1988	
Professional and scientific instruments.....	38	\$523	\$450	\$391	\$351	\$272	\$120	\$113	\$99
Scientific and mechanical measuring instruments.	381-82	(D)	(D)	(D)	(D)	(D)	(S)	(S)	(D)
Optical, surgical, photographic, and other instruments.....	384-87	(D)	(D)	(D)	(D)	(D)	96	103	89
Other manufacturing industries 1/.....	27,31,39	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonmanufacturing industries 2/.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	1,000	1,253	1,653	2,313	2,706	2,700	2,753	2,666
Distribution by size of company [Based on number of employees]									
Total.....	\$18,545	\$20,680	\$23,396	\$27,196	\$27,891	\$30,752	\$32,117	\$31,292	\$30,626
Fewer than 500 3/.....	523	641	621	739	868	963	864	987	975
500 to 999 4/.....	N/A	N/A	98	117	137	115	139	105	(S)
1,000 to 4,999.....	623	740	902	991	1,229	981	1,157	1,050	959
5,000 to 9,999.....	527	718	487	672	796	748	914	811	280
10,000 to 24,999.....	1,495	2,271	2,805	2,743	2,004	2,362	1,805	1,237	1,662
25,000 or more.....	15,377	16,311	18,483	21,933	23,213	25,583	27,239	27,102	26,610

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

3/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 80-87, and 87.

3/ Data for 1982-83 are for companies with fewer than 1,000 employees.

4/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-6. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total.....	.....	3.8	3.9	3.9	4.4	4.7	4.6	4.7	4.6	4.7	4.2	4.2
Distribution by industry:												
Food, kindred, and tobacco products 1/.....												
Textiles and apparel.....	20,21	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0.5	0.5
Lumber, wood products, and furniture.....	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Paper and allied products.....	24,25	0.8	0.8	0.7	0.8	0.6	0.6	0.6	0.6	0.7	0.7	0.7
Chemicals and allied products.....	26	1.1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0.7	0.8	1.1
Industrial chemicals.....	28	4.3	4.4	4.7	5.0	5.2	5.3	5.4	5.4	5.6	5.6	6.0
Drugs and medicines.....	281-82,286	4.0	3.9	4.0	4.4	4.6	4.7	4.5	4.4	4.7	4.6	4.6
Other chemicals.....	283	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	8.9	10.7
Petroleum refining and extraction.....	284-85,287-89	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	3.1	3.1
Rubber products.....	13,29	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	1.0	1.0
Stone, clay, and glass products.....	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Primary metals.....	32	1.1	1.3	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0.8	0.6
Ferrous metals and products.....	33	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Fabricated metal products.....	333-36	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Machinery.....	34	1.3	1.4	1.5	1.5	1.5	1.5	1.5	1.3	1.2	1.2	1.6
Office, computing, and accounting machines.....	35	5.6	6.2	6.4	7.6	7.6	(D)	(D)	(D)	8.7	8.9	8.1
Other machinery, except electrical.....	351-56,356-59	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electrical equipment.....	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Radio and TV receiving equipment.....	36	7.2	7.9	6.8	7.6	7.9	8.2	7.8	7.1	6.9	6.5	5.7
Communication equipment.....	365	(D)	(D)	(D)	(D)	(D)	3.6	3.2	3.0	2.8	3.1	(D)
Electronic components.....	366	11.0	11.5	9.8	10.1	9.9	10.2	9.8	8.7	7.7	9.8	7.7
Other electrical equipment.....	367	6.8	7.7	7.8	9.6	(D)	10.0	9.5	(D)	2.4	(D)	(D)
Transportation equipment.....	361-64,369	(D)	(D)	(D)	(D)	(D)	(D)	2.7	2.4	2.4	2.4	(D)
Motor vehicles and motor vehicles equipment.....	37	N/A	N/A	(D)	(D)	8.3	8.7	8.9	9.0	8.8	7.3	7.0
Other transportation equipment.....	371	4.5	4.0	3.4	3.8	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	373-75,379	(D)	(D)	15.4	14.9	13.4	14.7	15.6	15.3	14.3	12.1	11.8

See explanatory information and SOURCE at end of table.

Table N-6. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Professional and scientific instruments.....	38	8.4	8.6	8.3	8.9	8.8	7.9	7.5	7.5	7.8	9.1	8.9
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	(D)	(D)	(D)	(D)	8.5	8.6	9.5	10.0	10.5
Optical, surgical, photographic, and other instruments.....	384+87	(D)	(D)	(D)	(D)	(D)	(D)	7.1	7.1	7.1	8.1	8.4
Other manufacturing industries 1/.....	27,31,39	(D)	(D)	(D)	(D)	1.2	(D)	(D)	(D)	(D)	(D)	(D)
Distribution by size of company [Based on number of employees]												
Fewer than 500 2/.....		1.8	2.5	3.6	4.1	3.9	3.6	3.7	3.7	3.3	3.2	
500 to 999 3/.....		N/A	2.3	2.4	2.4	2.3	2.2	1.7	2.0	2.5	2.9	
1,000 to 4,999.....		1.9	2.0	2.2	2.6	2.6	2.5	2.1	2.3	2.5	2.9	
5,000 to 9,999.....		1.7	1.7	1.8	1.9	2.3	2.3	2.3	2.6	3.1	3.0	
10,000 to 24,999.....		2.4	2.8	3.1	3.2	3.1	3.1	2.7	2.9	3.6	3.5	
25,000 or more.....		5.4	5.5	6.2	6.5	6.6	6.6	6.4	6.4	5.6	5.5	

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
N/A = Not available

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-7. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total.....	.....	2.6	2.6	2.6	3	3.2	3.1	3.2	3.3	3.2	3.2	3.3
Distribution by industry												
Food, kindred, and tobacco products 1/.....	20,21	0.4	0.4	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5
Textiles and apparel.....	22,23	0.5	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.6	0.6	0.6
Lumber, wood products, and furniture.....	24,25	0.8	0.8	0.7	0.8	0.6	0.6	0.7	0.7	0.7	0.9	0.9
Paper and allied products.....	26	1.1	0.9	0.8	0.8	0.7	0.6	0.7	0.7	0.8	1.1	1.0
Chemicals and allied products.....	28	4.0	4.2	4.6	4.9	5.1	5.2	5.3	5.3	5.6	5.3	5.9
Industrial chemicals.....	281-82,286	3.5	3.4	3.8	4.2	4.4	4.4	4.3	4.3	4.7	4.4	4.4
Drugs and medicines.....	283	7.0	7.7	8.2	8.0	8.4	8.7	9.0	9.1	9.3	8.9	10.7
Other chemicals.....	284-85,287-89	2.3	2.5	2.9	3.1	3.3	3.3	3.5	3.4	3.7	3.0	3.1
Petroleum refining and extraction.....	13,29	0.8	0.7	0.7	0.9	1.1	1.0	1.0	1.0	1.0	1.0	1.0
Rubber products.....	30	1.7	1.7	1.9	1.8	1.7	1.6	1.6	1.7	1.7	2.3	2.5
Stone, clay, and glass products.....	32	1.7	1.9	1.9	2.3	2.4	2.5	2.5	2.2	2.3	2.4	1.6
Primary metals.....	33	0.8	0.8	0.9	0.9	1.0	0.9	0.8	0.9	1.0	0.8	0.6
Ferrous metals and products.....	331-32,3398-99	0.6	0.6	0.6	0.5	0.7	0.6	0.6	0.6	0.5	0.5	0.5
Nonferrous metals and products.....	333-36	1.3	1.2	1.2	1.4	1.5	1.3	1.1	1.2	1.5	1.2	0.8
Fabricated metal products.....	34	1.2	1.3	1.4	1.4	1.4	1.2	1.0	1.0	1.0	1.2	1.1
Machinery.....	35	5.0	5.4	5.8	6.7	7.3	7.1	7.2	8.0	8.3	7.5	7.3
Office, computing, and accounting machines.....	357	10.4	10.0	10.5	12.4	12.4	12.3	11.5	13.5	15.3	14.9	13.8
Other machinery, except electrical.....	351-56,358-59	2.4	2.4	2.5	2.6	2.9	3.0	3.1	3.0	2.9	2.9	2.9
Electrical equipment.....	36	4.4	5.0	4.5	4.8	5.1	5.4	5.3	4.9	4.7	4.3	4.1
Radio and TV receiving equipment.....	365	3.3	2.9	3.7	4.3	3.6	3.2	3.0	2.8	3.1	1.0	0.7
Communication equipment.....	366	6.7	7.2	5.1	5.4	5.2	5.5	5.4	5.3	4.3	(S)	7.1
Electronic components.....	367	5.2	6.6	6.6	8.2	9.2	8.5	8.4	8.0	8.5	7.2	7.2
Other electrical equipment.....	361-64,369	2.3	2.6	2.2	2.0	2.2	2.6	2.4	2.0	2.3	2.2	2.2
Transportation equipment.....	37	N/A	N/A	3.3	3.4	3.6	3.4	3.5	3.7	3.6	4.0	4.1
Motor vehicles and motor vehicles equipment.....	371	4.0	3.5	3.0	3.1	3.3	3.4	3.4	3.8	3.9	4.1	4.0
Other transportation equipment.....	373-75,379	0.7	1.7	2.0	2.3	2.7	2.5	2.5	2.3	1.8	2.1	(S)
Aircraft and missiles.....	372,376	5.1	4.1	3.9	4.0	3.9	3.6	3.6	3.5	4.0	4.6	4.6

See explanatory information and SOURCE at end of table.

Table N-7. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Professional and scientific instruments.....	38	7.3	7.7	7.6	8.3	8.2	7.5	7.3	7.3	7.6	7.1	7.2
Scientific and mechanical measuring instruments, Optical, surgical, photographic, and other instruments.....	381-82	7.6	8.8	8.3	8.4	8.4	8.1	8.4	8.5	9.4	6.3	6.2
Other manufacturing industries 1/.....	384-87	7.1	7.1	7.3	8.1	8.0	7.2	6.9	6.9	6.9	8.0	8.2
	27,31,39	0.8	1.0	1.1	1.0	1.2	1.1	1.1	1.0	1.1	0.8	1.0
Distribution by size of company [Based on number of employees]												
Fewer than 500 2/.....		1.6	2.2	2.8	3.4	4.0	3.8	3.6	3.6	3.6	3.2	3.0
500 to 999 3/.....	N/A		2.2	2.2	2.2	2.2	2.2	2.1	1.6	1.8	2.4	2.8
1,000 to 4,999.....		1.7	2.0	2.0	2.4	2.4	2.4	2.1	2.1	2.0	2.4	2.8
5,000 to 9,999.....		1.5	1.3	1.6	1.8	2.0	2.0	2.3	2.3	2.5	3.0	2.9
10,000 to 24,999.....		2.0	2.3	2.5	2.5	2.6	2.6	2.4	2.6	2.6	3.0	2.9
25,000 or more.....		3.3	3.4	3.2	3.5	3.7	3.8	3.7	3.8	3.9	3.8	3.9

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.
N/A = Not available

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-8. Total (company, Federal, and other) funds for performance of basic research, applied research, and development, in current and in constant dollars: 1953-92

[Dollars in millions]

Page 1 of 1

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
1953 1/.....	\$3,630	\$16,500	\$151	\$686	\$726	\$3,300	\$2,753	\$12,514
1954 1/.....	4,070	18,333	166	748	814	3,667	3,090	13,919
1955 1/.....	4,640	20,262	189	825	928	4,052	3,523	15,384
1956.....	6,605	27,987	253	1,072	1,268	5,373	5,084	21,542
1957.....	7,731	31,684	271	1,111	1,670	6,844	5,790	23,730
1958.....	8,389	33,691	295	1,185	1,911	7,675	6,183	24,831
1959.....	9,618	37,570	320	1,250	1,991	7,777	7,307	28,543
1960.....	10,509	40,419	376	1,446	2,029	7,804	8,104	31,169
1961.....	10,908	41,475	395	1,502	1,977	7,517	8,536	32,456
1962.....	11,464	42,617	488	1,814	2,449	9,104	8,527	31,699
1963.....	12,630	46,434	522	1,919	2,457	9,033	9,651	35,482
1964.....	13,512	48,780	549	1,982	2,600	9,386	10,363	37,412
1965.....	14,185	49,947	592	2,085	2,658	9,359	10,935	38,504
1966.....	15,548	52,884	624	2,122	2,843	9,670	12,081	41,092
1967.....	16,385	54,076	629	2,076	2,915	9,620	12,841	42,380
1968.....	17,429	54,808	642	2,019	3,124	9,824	13,663	42,965
1969.....	18,308	54,814	618	1,850	3,287	9,841	14,403	43,123
1970.....	18,067	51,327	602	1,710	3,427	9,736	14,038	39,881
1971.....	18,320	49,380	590	1,590	3,415	9,205	14,315	38,585
1972.....	19,552	50,392	593	1,528	3,514	9,057	15,445	39,807
1973.....	21,249	51,450	631	1,528	3,825	9,262	16,793	40,661
1974.....	22,887	50,973	699	1,557	4,288	9,550	17,900	39,866
1975.....	24,187	49,161	730	1,484	4,570	9,289	18,887	38,388
1976.....	26,997	51,620	819	1,566	5,112	9,774	21,066	40,279
1977.....	29,825	53,354	911	1,630	5,636	10,082	23,278	41,642
1978 1/.....	33,304	55,231	1,035	1,716	6,300	10,448	25,969	43,066
1979.....	38,226	58,271	1,158	1,765	7,225	11,014	29,843	45,492
1980 1/.....	44,505	62,071	1,325	1,848	8,450	11,785	34,730	48,438
1981.....	51,810	65,665	1,614	2,046	10,699	13,560	39,497	50,060
1982 1/.....	58,650	69,988	1,904	2,272	12,323	14,705	44,423	53,011
1983.....	65,268	74,849	2,223	2,549	13,927	15,971	49,118	56,328
1984.....	74,800	82,198	2,608	2,866	15,765	17,324	56,427	62,008
1985.....	84,239	89,236	2,862	3,032	18,255	19,338	63,122	66,867
1986.....	87,823	90,633	4,047	4,176	19,759	20,391	64,017	66,065
1987.....	92,155	92,155	4,324	4,324	19,813	19,813	68,018	68,018
1988.....	97,889	94,215	4,243	4,084	20,757	19,978	72,889	70,153
1989.....	101,854	93,875	4,646	4,282	22,388	20,634	74,820	68,959
1990.....	104,606	92,327	4,909	4,333	23,628	20,854	76,069	67,139
1991.....	116,952	99,449	9,423	8,013	26,172	22,255	81,357	69,181
1992.....	121,314	100,342	9,744	8,101	27,175	22,477	84,345	69,764

1/ Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, National Patterns of R&D Resources: 1992, Final Report, NSF 92-330.

NOTES: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

1987 gross domestic product implicit price deflators were used to convert current dollars to constant dollars.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-9. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1982-92 and projected 1993

Industry	SIC code	[Dollars in millions]										Page 1 of 2	
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	
Total.....		\$4,240	\$4,345	\$4,446	\$3,954	\$3,358	\$3,576	\$3,738	\$3,536	\$4,105	\$4,615	\$4,889	\$5,079
Food, kindred, and tobacco products 1/.....	20-21	(T)	(T)	(S)	2	2	(S)	2/	(D)	(D)	(D)	(D)	(D)
Textiles and apparel.....	22-23	5	5	5	3	1	(D)	(D)	(D)	(D)	(D)	(D)	0
Lumber, wood products, and furniture.....	24-25	5	3	6	162	(S)	(S)	1	(S)	(D)	(D)	(D)	(D)
Paper and allied products.....	26	3	191	191	(D)	(D)	(D)	(S)	130	(D)	(D)	(D)	(D)
Chemicals and allied products.....	28	347	345	(D)	(D)	(D)	(D)	128	(D)	(D)	(D)	(D)	(D)
Industrial chemicals.....	281-82,286	338	335	181	(D)	(D)	(D)	(D)	128	(D)	(D)	(D)	(D)
Drugs and medicines.....	283	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other chemicals.....	284-85,287-89	(T)	(T)	(D)	(D)	(D)	(D)	4	(D)	(D)	(D)	(D)	(D)
Petroleum refining and extraction.....	13-29	1,162	1,284	1,356	1,199	999	914	989	989	966	1,416	1,401	1,395
Rubber products.....	30	14	17	16	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products.....	32	17	7	5	(S)	(S)	(S)	(D)	1	(D)	(D)	(D)	(D)
Primary metals.....	33	101	92	(S)	(S)	74	18	21	(D)	(D)	(D)	26	23
Ferrous metals and products.....	331-32,333-36	22	35	35	26	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	79	57	(S)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Fabricated metal products.....	34	54	31	(D)	8	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Machinery.....	35	183	163	201	240	261	(D)	(D)	230	14	49	2	(S)
Office, computing, and accounting machines.....	351-56,358-59	167	144	(T)	(S)	12	(D)	(D)	(D)	0	(D)	(D)	(D)
Other machinery, except electrical.....						228	(D)	(D)	(D)	236	(D)	(D)	(D)
Electrical equipment.....	36	831	813	752	733	(D)	578	744	762	820	(D)	(D)	(D)
Radio and TV receiving equipment.....	365	5	0	0	0	(D)	(D)	(D)	0	0	(D)	(D)	0
Communication equipment.....	366	155	150	(D)	115	(D)	(D)	(D)	(D)	(D)	(D)	(D)	7
Electronic components.....	367	40	82	(D)	618	(D)	(D)	(D)	(D)	20	(D)	(D)	6
Other electrical equipment.....	361-64,369	631	581	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Transportation equipment.....	37	(T)	(T)	(D)	(S)	(S)	(D)	(D)	847	(S)	(S)	(S)	(S)
Motor vehicles and motor vehicles equipment.....	371	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	363	425	661	681	754	726	614	(S)	(S)	(D)	(D)	0
Aircraft and missiles.....	372,376										(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table N-9. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1982-92 and projected 1993

Industry	SIC code	[Dollars in millions]									Page 2 of 2		
		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Professional and scientific instruments.....		38	\$54	\$45	\$36	(D)	(D)	\$17	\$16	\$12	\$11	(S)	(S)
Scientific and mechanical measuring instruments.....	381-82	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments.....	384-87	(T)	(T)	(D)	(D)	0	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other manufacturing industries I.	27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	12 375 349 424	17 328 424	12 0 328	0 433 424	0 0 489	0 433 489	(D) (D)	(D)	(D)	(D)	(D)	0
Nonmanufacturing industries													824

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available but are included in total.

1/ Until 1984, tobacco products, SIC 21, was included with "Other manufacturing industries."

2/ Less than \$0.5 million.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-10. Company and other (except Federal) funds for industrial energy R&D performance, by selected industry: 1982-92 and projected 1993

Industry	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993
[Dollars in millions]													
Total.....		\$2,762	\$2,842	\$2,962	\$2,537	\$2,167	\$2,410	\$2,353	\$2,271	\$2,687	\$2,691	\$2,812	\$2,883
Chemicals and allied products.....	28	178	166	169	(D)	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)
Petroleum refining and extraction.....	13,29	1,096	1,218	(D)	1,145	957	911	983	99	963	1,409	1,394	1,387
Machinery.....	35	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)	229
Electrical equipment...	36	146	132	123	71	(D)	(D)	(D)	(D)	(D)	378	101	(D)
Aircraft and missiles.....	372,376	99	(T)	190	264	236	(D)	(D)	279	246	(D)	(D)	(D)
All other manufacturing industries.....	.....	1,079	(T)	189	779	610	497	564	478	(D)	(D)	(D)	(S)
Nonmanufacturing industries 1/.....	07-10, 12-17	164	143	189	84	(D)	170	(S)	243	282	274	311	247
40-42, 44-49	50-59, 60-65, 67,	701, 73, 75-76,	78-79, 80-81,	83-84, 87, 89									

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld due to imputation of more than 50 percent.

(T) = Data not separately available but are included in total.

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 80-87, and 87.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-11. Federal funds for industrial energy R&D performance, by selected industry: 1982-92 and projected 1993

Industry	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993
[Dollars in millions]													
Total.....		\$1,478	\$1,503	\$1,484	\$1,417	\$1,191	\$1,166	\$1,385	\$1,265	\$1,418	\$1,924	\$2,077	(S)
Petroleum refining and extraction.....	28	169	179	22	(D)	(D)	(D)	(D)	(D)	31	16	(D)	(D)
Machinery.....	13,29	66	66	(D)	54	42	3	4	6	3	6	7	8
Electrical equipment...	35	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)	(S)
Aircraft and missiles.....	36	685	681	629	662	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
All other manufacturing industries.....	372,376	264	(T)	471	417	302	(D)	(D)	447	368	(D)	(D)	(D)
Nonmanufacturing industries 1/.....	07-10, 12-17	83	(T)	52	13	4	5	5	263	(D)	1	1	3
40-42, 44-49	50-59, 60-65, 67,	701, 73, 75-76,	78-79, 80-81,	83-84, 87, 89							253	316	423
													514

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available but are included in total.

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 80-87, and 87.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-12. Total (company, Federal, and other) funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

[Dollars in millions]

Primary energy source	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993		
												1982	1983	
Total.....	\$4,240	\$4,345	\$4,446	\$3,954	\$3,358	\$3,576	\$3,738	\$3,536	\$4,105	\$4,615	\$4,889	\$5,079	(S)	
Fossil fuels.....	1,491	1,573	1,738	1,876	1,476	1,548	1,606	1,601	1,810	2,128	(S)	N/A	N/A	
Oil.....	N/A	N/A	N/A	905	N/A	1,395	N/A	N/A	N/A	N/A	(S)	(S)	(S)	(S)
Gas.....	N/A	N/A	N/A	255	N/A	189	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Shale.....	N/A	N/A	N/A	48	N/A	125	N/A	11	N/A	72	(S)	(S)	N/A	N/A
Coal.....	N/A	N/A	(T)	N/A	150	N/A	46	N/A	N/A	N/A	(S)	(S)	N/A	N/A
Synthetic fossil fuels.....	N/A	N/A	(T)	N/A	111	N/A	23	N/A	N/A	14	(S)	(S)	N/A	N/A
Mining.....	N/A	N/A	(T)	N/A	8	N/A	3	N/A	N/A	N/A	(S)	(S)	N/A	N/A
Other.....	N/A	N/A	(T)	N/A	31	N/A	(S)	N/A	N/A	N/A	(S)	(S)	N/A	N/A
Other fossil fuels	N/A	N/A	(T)	N/A	17	N/A	51	N/A	N/A	N/A	58	N/A	N/A	N/A
Nuclear.....	1,078	1,118	1,113	1,212	979	926	1,097	943	1,065	1,139	1,191	1,359	N/A	N/A
Fission.....	N/A	973	N/A	1,062	N/A	859	N/A	866	N/A	1,134	N/A	N/A	N/A	N/A
Fusion.....	N/A	145	N/A	150	N/A	(S)	N/A	77	N/A	5	N/A	N/A	N/A	N/A
Total geothermal, solar, and conservation and utilization.....	N/A	1,424	1,218	471	504	421	497	582	594	866	1,029	996	N/A	N/A
Geothermal.....	N/A	N/A	(T)	N/A	54	N/A	48	N/A	N/A	16	(S)	(S)	N/A	N/A
Solar.....	N/A	N/A	(T)	N/A	96	N/A	95	N/A	N/A	(S)	N/A	N/A	N/A	N/A
Conservation and utilization.....	N/A	N/A	(T)	N/A	321	N/A	281	N/A	417	N/A	(S)	N/A	N/A	N/A
All other energy.....	N/A	230	377	395	399	(S)	538	410	636	507	(S)	(S)	(S)	(S)

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data are not separately available, but are included in total.

N/A = Not available

NOTE: Detailed data for 1983, 1985, 1987, and 1989 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1984, 1986, 1988 and 1990 survey forms, and (c) adjustments to new samples in 1987.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-13. Company and other (except Federal) funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

[Dollars in millions]

Primary energy source	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993	Page 1 of 1
Total.....	\$2,762	\$2,842	\$2,962	\$2,537	\$2,167	\$2,410	\$2,353	\$2,271	\$2,687	\$2,691	\$2,812	\$2,883	
Fossil fuels.....	1,361	1,455	1,509	1,797	(D)	(D)	1,543	(D)	(D)	1,869	1,918	1,953	
Oil.....	N/A	(T)	N/A	1,381	N/A	(S)	N/A	(S)	N/A	N/A	N/A	N/A	
Gas.....	N/A	(T)	N/A	(D)	N/A	(S)	N/A	(S)	N/A	N/A	N/A	N/A	
Shale.....	N/A	(T)	N/A	124	N/A	(S)	N/A	(S)	N/A	N/A	N/A	N/A	
Coal.....	N/A	(T)	N/A	(S)	N/A	29	N/A	(S)	N/A	N/A	N/A	N/A	
Synthetic fossil fuels.....	N/A	(T)	N/A	91	N/A	(S)	N/A	(D)	N/A	N/A	N/A	N/A	
Mining.....	N/A	(T)	N/A	8	N/A	(D)	N/A	(D)	N/A	N/A	N/A	N/A	
Other.....	N/A	(T)	N/A	(S)	N/A	(D)	N/A	(D)	N/A	N/A	N/A	N/A	
Other fossil fuels.....	N/A	(T)	N/A	17	N/A	(S)	N/A	(S)	N/A	N/A	N/A	N/A	
Nuclear.....	99	90	101	150	91	109	118	84	180	46	60	208	
Fission.....	N/A	71	N/A	135	N/A	82	N/A	57	N/A	45	N/A	N/A	
Fusion.....	N/A	19	N/A	15	N/A	(S)	N/A	27	N/A	1		N/A	
Total geothermal, solar, and conservation and utilization.....	N/A	1,147	1,086	313	(D)	(D)	319	(D)	(D)	478	571	531	
Geothermal.....	N/A	(T)	N/A	27	N/A	(D)	N/A	(D)	N/A	(S)	N/A	N/A	
Solar.....	N/A	(T)	N/A	51	N/A	(D)	N/A	(D)	N/A	(S)	N/A	N/A	
Conservation and utilization.....	N/A	(T)	N/A	235	N/A	(D)	N/A	281	N/A	(S)	N/A	N/A	
All other energy.....	N/A	150	267	277	(D)	(D)	373	(D)	462	298	263	196	

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

N/A = Not available

NOTE: Detailed data for 1983, 1985, 1987, 1989, and 1991 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1982, 1984, 1986, 1988, 1990, and 1992 survey forms and, (c) adjustments to new samples in 1981 and 1987.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-14. Federal funds for industrial energy R&D performance, by primary energy source: 1982-92 and projected 1993

[Dollars in millions]

Primary energy source	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Projected 1993
Total.....	\$1,478	\$1,503	\$1,484	\$1,417	\$1,191	\$1,166	\$1,385	\$1,265	\$1,418	\$1,924	\$2,077	(S)
Fossil fuels.....	130	117	228	78	(D)	(D)	63	(D)	(D)	(S)	(S)	(S)
Oil.....	N/A	(T)	N/A	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gas.....	N/A	10	N/A	(D)	N/A	N/A	(S)	(S)	(S)	N/A	N/A	N/A
Shale.....	N/A	1	N/A	1	N/A	N/A	(S)	(S)	(S)	N/A	N/A	N/A
Coal.....	N/A	76	N/A	(S)	N/A	N/A	(S)	(S)	(S)	N/A	N/A	N/A
Synthetic fossil fuels.....	N/A	(T)	(T)	(T)	N/A	20	N/A	(D)	(D)	(S)	(S)	N/A
Mining.....	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other.....	N/A	(T)	(T)	(T)	(S)	N/A	N/A	N/A	N/A	(D)	(D)	N/A
Other fossil fuels.....	N/A	16	N/A	0	N/A	1	N/A	N/A	N/A	(S)	N/A	N/A
Nuclear.....	979	1,029	1,013	1,063	888	817	979	859	885	1,093	1,133	\$1,151
Fission.....	N/A	902	N/A	928	N/A	777	N/A	N/A	809	N/A	N/A	N/A
Fusion.....	N/A	127	N/A	135	N/A	(S)	N/A	50	1,089	4	N/A	N/A
Total geothermal, solar, and conservation and utilization.....	N/A	277	132	158	(D)	(D)	173	(D)	(D)	(S)	(S)	(S)
Geothermal.....	N/A	(T)	N/A	26	N/A	(D)	N/A	N/A	N/A	11	N/A	N/A
Solar.....	N/A	(T)	N/A	45	N/A	37	N/A	N/A	N/A	38	N/A	N/A
Conservation and utilization.....	N/A	80	N/A	87	N/A	(D)	N/A	N/A	(D)	(S)	N/A	N/A
All other energy.....	N/A	80	110	118	(D)	(D)	165	(D)	174	(S)	221	(S)

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

N/A = Not available

NOTE: Detailed data for 1981, 1983, 1985, 1987, and 1989 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1980, 1982, 1984, 1986, 1988, and 1990 survey forms, and (c) adjustments to new samples in 1981 and 1987.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-15. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1983-93

Industry and size of company	SIC code	[In thousands]						Page 1 of 2			
		1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total (January).....		540.9	584.1	622.5	671.0	695.8	708.6	720.2	730.9	704.1	779.3
Total (Annual average).....		562.5	603.3	646.8	683.4	702.2	714.4	725.5	717.5	741.7	783.2
Distribution by industry:											787.1 N/A
Food, kindred, and tobacco products 1/.....		20.21	7.7	7.4	(S)	(S)	(S)	(S)	(S)	9.4	9.8
Textiles and apparel.....		22.23	2.2	2.3	2.8	2.6	2.4	2.4	(S)	2.8	3.1
Lumber, wood products, and furniture.....		24.25	1.8	(T)	(S)	1.3	1.3	(S)	(S)	1.5	1.7
Paper and allied products.....		24.26	7.6	6.6	6.4	6.0	6.1	5.7	(S)	6.5	10.7
Chemicals and allied products.....		28	67.3	69.8	71.1	75.8	75.8	77.6	78.9	78.8	85.6
Industrial chemicals.....		281-82,286	26.6	25.6	23.5	24.9	(S)	(S)	(S)	(S)	29.9
Drugs and medicines.....		283	28.2	(T)	30.8	31.8	32.6	33.0	34.0	33.5	38.7
Other chemicals.....		284-85,287-89	12.1	13.4	16.7	19.1	20.2	20.3	20.5	22.4	21.9
Petroleum refining and extraction.....		13.29	14.7	13.3	13.5	10.4	9.9	9.5	10.3	10.2	10.0
Rubber products.....		30	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	14.8
Stone, clay, and glass products.....		32	5.5	5.6	6.6	7.5	8.6	8.6	8.5	8.6	8.3
Primary metals.....		33	8.3	8.4	7.1	5.7	5.5	5.6	5.7	(S)	5.3
Ferrous metals and products.....		331-32,3398-99	5.2	5.3	4.2	2.5	(S)	2.3	(S)	(S)	5.1
Nonferrous metals and products.....		333-36	3.0	3.1	2.9	3.2	3.4	3.3	3.3	3.4	4.9
Fabricated metal products.....		34	(T)	16.6	(S)	(S)	9.9	10.5	9.7	(S)	1.7
Machinery.....		35	79.6	87.0	81.7	89.7	95.8	98.4	99.8	112.3	107.2
Office, computing, and accounting machines.....		357	52.6	56.5	61.8	71.9	73.4	74.4	76.7	88.6	83.0
Other machinery, except electrical.....		351-56,358-59	27.0	30.5	19.9	17.8	22.4	24.0	23.1	23.7	24.2
Electrical equipment.....		36	108.6	113.2	117.9	130.4	132.5	140.6	138.0	137.7	91.9
Radio and TV receiving equipment.....		365	(T)	(T)	(S)	1.8	1.2	1.3	1.3	0.6	1.0
Communication equipment.....		366	48.8	59.3	62.2	65.0	71.9	73.1	72.8	74.2	31.2
Electronic components.....		367	25.6	(T)	29.2	(S)	43.7	44.3	(S)	48.5	28.4
Other electrical equipment.....		361-64,369	(T)	18.4	17.9	16.5	13.6	(S)	16.7	(S)	31.2
Transportation equipment.....		37	134.3	(T)	160.3	179.2	187.3	188.2	193.0	183.7	167.8
Motor vehicles and motor vehicles equipment.....		371	29.0	28.6	28.7	33.9	46.5	47.3	45.9	49.6	44.5
Other transportation equipment.....		373-75,379	2.2	(T)	130.2	(S)	(S)	136.3	136.4	(S)	(S)
Aircraft and missiles.....		372,376	103.1	111.5	111.5	144.8	144.8	142.3	142.3	117.9	92.9

See explanatory information and SOURCE at end of table.

Table N-15. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1983-93

Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
[In thousands]												
Distribution by industry:												
Professional and scientific instruments.....	38	(T)	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Scientific and mechanical measuring instruments.....	381-82	(T)	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Optical, surgical, photographic, and other instruments.....	384-87	(T)	(T)	19.8	24.0	24.6	24.9	24.2	(S)	(S)	(S)	21.0
Other manufacturing industries 1/.....	27,31,39 07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	5.9 31.2	49.8	(S) 66.8	(S) 75.1	6.3 96.4	6.4 101.9	5.4 (S)	(S)	(S)	6.0 (S)	5.9 202.6
Nonmanufacturing industries 2/.....												
Distribution by size of company [Based on number of employees]												
Total (January).....	540.9	584.1	622.5	671.0	695.8	708.6	720.2	730.9	704.1	779.3	787.1	
Fewer than 500 3/.....	52.7	81.9	78.3	(S)	105.2	109.0	(S)	(S)	(S)	18.3	142.1	140.3
500 to 999 4/.....	N/A	N/A	16.5	(S)	18.4	19.3	17.9	18.3	(S)	46.2	48.5	
1,000 to 4,999.....	48.3	52.6	61.6	66.7	76.4	81.9	75.9	74.1	72.2	94.2	102.6	
5,000 to 9,999.....	29.8	30.1	28.5	38.9	40.5	40.2	47.1	56.2	50.2	57.6	58.7	
10,000 to 24,999.....	84.3	84.0	89.9	88.4	92.0	94.5	86.7	72.6	82.2	99.9	103.8	
25,000 or more.....	325.8	335.5	347.6	365.3	363.3	363.7	387.5	397.3	371.7	339.2	333.2	

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 65-63, 72-73, 78, 80-87, and 87.

3/ Data for 1983-84 are for companies with fewer than 1,000 employees.

4/ Until 1985, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

N/A = Not available

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-16. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total.....	\$111,600	\$116,000	\$124,000	\$130,200	\$128,500	\$131,200	\$137,000	\$140,600	\$145,800	\$148,600	\$154,900	
Distribution by industry												
Food, kindred, and tobacco products 1/.....	20,21	(D)	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)	130,000	143,500
Textiles and apparel.....	22,23	(D)	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)	94,100	94,100
Lumber, wood products, and furniture.....	24,25	(S)	(S)	115,400	116,300	(S)	(S)	(D)	(D)	(S)	137,300	137,300
Paper and allied products.....	26	70,800	104,800	(D)	(D)	(D)	(D)	(D)	(D)	(S)	116,100	116,100
Chemicals and allied products.....	28	102,500	116,300	112,500	116,300	117,100	127,600	140,400	146,600	(S)	167,600	191,300
Industrial chemicals.....	281-82,286	122,100	132,000	144,600	150,200	(S)	(D)	141,700	(S)	(D)	181,000	181,600
Drugs and medicines.....	283	(D)	(D)	(D)	(D)	113,600	(D)	101,300	(D)	(D)	(D)	217,400
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	(D)	83,100	(D)		(D)	(D)	(D)	145,700
Petroleum refining and extraction.....	13,29	(D)	(D)	(D)	(D)	(D)	(D)	195,600	196,400	201,600	209,900	217,000
Rubber products.....	30	(D)	75,400	(D)	(D)	(D)	118,000	115,700	(D)	(D)	(D)	203,300
Stone, clay, and glass products.....	32	(D)	(D)	(D)	(D)	(D)	129,900	131,500	117,300	(S)	(D)	89,800
Primary metals.....	33	118,200	(D)	(D)	(D)	(D)				(D)	(D)	111,100
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	112,000	136,400	138,800	(D)	(D)	(D)	142,200
Nonferrous metals and products.....	333-36	(D)	(D)	(D)	(D)	111,600	112,900	(S)	76,800	82,100	(S)	110,600
Fabricated metal products.....	34	(S)	(S)	(S)	(S)	108,400	124,500	142,500	(D)	(D)	(D)	142,200
Machinery.....	35	103,800	103,800	(D)	(D)	(D)	(D)	(D)	119,200	104,700	138,400	134,000
Office, computing, and accounting machines.....	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	136,400
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)
Electrical equipment.....	36	100,000	114,300	121,700	124,900	120,700	120,600	118,900	121,600	128,500	147,100	148,600
Radio and TV receiving equipment.....	365	(D)	105,300	(D)	(D)	(D)	(D)	88,700	111,200	106,900	92,300	94,400
Communication equipment.....	366	123,300	135,000	143,000	147,800	141,300	140,500	141,100	140,800	148,700	(S)	(S)
Electronic components.....	367	69,600	(D)	(D)	(D)	114,100	(D)	(D)	97,400	(S)	108,800	126,900
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)	(D)	158,600
Transportation equipment.....	37	(D)	(D)	(D)	(D)	(D)	(D)	170,700	182,400	190,700	195,700	205,000
Motor vehicles and motor vehicles equipment.....	371	162,600	184,700	211,400	223,100	(D)	(D)	(D)	(D)	(D)	(D)	222,400
Other transportation equipment.....	373-75,379	(D)	114,200	(D)	161,700	143,600	156,000	149,800	179,400	(D)	(D)	(S)
Aircraft and missiles.....	372,376	148,800	148,800						185,900	189,400	205,900	171,600

See explanatory information and SOURCE at end of table.

Table N-17. R&D scientists and engineers per 1,000 employees in manufacturing companies, by industry and size of company: 1982-92

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Distribution by industry												
Professional and scientific instruments.....	38	(S)	(S)	(S)	(S)	(S)	(S)	(S)	71	70	76	72
Scientific and mechanical measuring instruments.....	381-82	(S)	(S)	(S)	(S)	(S)	(S)	(S)	85	94	106	107
Optical, surgical, photographic, and other instruments.....	383-87	(S)	(S)	(S)	70	61	63	58	60	54	(S)	66
Other manufacturing industries 1/.....	27,31,39	9	(S)	(S)	(S)	(S)	(S)	18	18	16	16	14
Distribution by size of company [Based on number of employees]												
Less than 500 2/.....	30	34	42	50	59	59	58	59	59	59	56	61
500 to 999 3/.....	N/A	N/A	21	21	23	27	26	27	27	27	32	37
1,000 to 4,999.....	22	25	24	26	32	30	31	30	30	30	34	40
5,000 to 9,999.....	23	22	19	19	28	29	29	39	39	37	38	38
10,000 to 24,999.....	26	26	29	30	33	32	34	31	33	36	41	41
25,000 or more.....	43	42	47	49	56	57	58	62	66	66	62	62

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Data for 1982-83 are for companies with fewer than 1,000 employees.

3/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

NOTE: The number of R&D scientists and engineers per 1,000 employees for 1992 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1991 and January 1992 by the number of employees in all activities in March 1991. Similar procedures were used for earlier years. Nonmanufacturing industries are included in pre-1983 calculations.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table N-18. R&D funds per employee in R&D-performing companies, by size of company: 1982-92

Page 1 of 1

Size of company [Number of employees]	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total (company, Federal, and other) R&D funds per employee											
Total.....	\$3,719	\$4,163	\$4,579	\$5,148	\$5,153	\$5,338	\$5,678	\$6,122	\$6,194	\$6,842	\$7,268
Fewer than 500 1/.....	1,732	2,186	2,767	3,028	5,414	5,553	5,318	5,618	6,056	7,279	7,688
500 to 999 2/.....	N/A	N/A	2,158	2,238	3,229	3,121	2,900	3,157	3,626	(W)	(W)
1,000 to 4,999.....	1,790	2,042	2,480	2,725	3,261	3,395	3,232	3,394	3,573	4,243	5,025
5,000 to 9,999.....	1,883	2,194	2,505	2,851	2,849	3,210	4,009	4,082	4,204	4,706	4,948
10,000 to 24,999.....	2,469	2,966	3,385	3,500	3,334	3,668	3,725	3,522	4,222	5,223	5,619
25,000 or more.....	5,502	5,785	6,184	7,071	6,878	7,035	7,547	8,027	8,014	8,252	8,619
Company and other (except Federal) R&D funds per employee											
Total.....	\$2,534	\$2,814	\$3,095	\$3,383	\$3,503	\$3,562	\$3,804	\$4,140	\$4,381	\$5,322	\$5,791
Fewer than 500 1/.....	1,381	1,749	2,212	2,407	4,750	4,811	4,686	4,891	5,339	6,242	6,553
500 to 999 2/.....	N/A	N/A	1,782	1,700	2,997	2,859	2,657	2,968	3,369	(W)	(W)
1,000 to 4,999.....	1,503	1,687	2,096	2,316	2,725	2,799	2,740	2,931	3,133	3,817	4,561
5,000 to 9,999.....	1,551	1,613	2,199	2,409	2,316	2,682	3,309	3,493	4,013	4,228	4,463
10,000 to 24,999.....	2,025	2,351	2,689	2,769	2,697	2,969	3,139	3,095	3,617	4,106	4,435
25,000 or more.....	3,436	3,637	3,792	4,208	4,077	4,010	4,346	4,851	4,917	5,739	6,228

1/ Data for 1982-83 are for companies with fewer than 1,000 employees.

2/ Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: N/A = Not available

(W) = Data have been withheld pending further review.

NOTE: Averages were derived by dividing total and company R&D funds for a calendar year by employment data for March of that year.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

SURVEY DEFINITIONS

Company (and Other) Funds for R&D

Cost of R&D actually performed within the company and funded by the company itself or by other non-Federal sources via contract, not including the cost of R&D supported by companies but contracted to outside organizations such as research institutions, universities and colleges, nonprofit organizations, or (to avoid double-counting) other companies.

Cost Per R&D Scientist or Engineer

The arithmetic mean of the numbers of full-time equivalent (FTE) scientists and engineers engaged in the performance of R&D reported for January in 2 consecutive years divided into the total R&D expenditures of the earlier year, with the ratio attributed to the earlier year (For example, the mean of the numbers of FTE R&D scientists and engineers in January 1991 and January 1992 is divided into total 1991 R&D expenditures for a total cost per R&D scientist or engineer in 1991.)

Employment, FTE R&D Scientists and Engineers

Persons employed by the company during the January following the survey year who are engaged in

scientific or engineering work at a level that requires knowledge of physical, life, engineering, or mathematical science equivalent at least to that acquired through completion of a 4-year college program with a major in one of those fields. (The statistics in this report show the full-time equivalent (FTE) employment. The FTE is the number of scientists and engineers in the company who are assigned full time to R&D projects plus the number of non-full-time R&D scientists and engineers prorated according to the fraction of their total work time spent on R&D projects.)

Employment, Total

Number of persons domestically employed by R&D-performing companies in all activities during the pay period that includes the 12th of March.

Federally Funded Research and Development Centers (FFRDCs)

R&D-performing organizations administered by industrial, educational, or other institutions on a nonprofit basis, exclusively or substantially financed by the Federal Government (R&D expenditures of the FFRDCs that are industry administered are included with the Federal R&D data of the industry classification of each of the administering firms. The industry-administered FFRDCs included in the 1992 survey are listed below.)

FFRDCs Supported by the Department of Energy:

Bettis Atomic Power Laboratory
Westinghouse Electric Corp.
West Mifflin, PA

Energy Technology Engineering Center
Rockwell International Corp.
Canoga Park, CA

Hanford Engineering Development Laboratory
Westinghouse-Hanford Corp.
Richland, WA

Idaho National Engineering Laboratory
EG&G Idaho, Inc.;
Westinghouse Electric Corp.
Argonne National Laboratory, West;
Rockwell International Corp.;
Idaho Falls, ID

Knolls Atomic Power Laboratory
General Electric Co.
Schenectady, NY

Oak Ridge National Laboratory
Martin Marietta Energy Systems, Inc.
Oak Ridge, TN

Sandia National Laboratories
Western Electric Co., Inc.–Sandia Corp.
Albuquerque, NM

Savannah River Laboratory
Westinghouse Electric Corp.
Aiken, SC

FFRDCs Supported by the National Institutes of Health, Department of Health and Human Services:

NCI Frederick Cancer Research Facility
Program Resources, Inc.
Frederick, MD

Funds for R&D, Federal - receipts for R&D performed by the company under Federal R&D contracts or subcontracts and R&D portions of Federal procurement contracts and subcontracts.

Funds for R&D, total - operating expenses incurred by a company in the conduct of R&D in its own laboratories or other company owned or operated facilities including wages and salaries, materials and supplies, property and other taxes, maintenance and repairs, depreciation, and an appropriate share of overhead, not including capital expenditures.

Net sales and receipts - dollar values for goods sold or services rendered by R&D-performing companies to customers (outside the company), including the Federal Government, less such items as returns, allowances, freight, charges, and excise taxes. (Domestic intracompany transfers and sales by foreign subsidiaries are excluded, but transfers to foreign subsidiaries and export sales to foreign companies are included.)

Research and development - basic and applied research in the sciences and engineering and the design and development of prototypes and processes, excluding quality control, routine product testing, market research, sales promotion, sales service, other nontechnological activities or routine technical services, and research in the social sciences or psychology.

Basic research - original investigations for the advancement of scientific knowledge not having specific immediate commercial objectives, although such investigations may be in fields of present or potential interest to the reporting company.

Applied research - investigations for the discovery of new scientific knowledge having specific commercial objectives with respect to products or processes. (Applied research differs from basic research chiefly in terms of the objectives of the reporting company.)

Development - technical activities not routine in nature concerned with translating research findings or other scientific knowledge into products or processes. (Not included are routine technical services to customers or other activities excluded above.)

SECTION C. SURVEY DOCUMENTS

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OFFICE OF THE
DIRECTOR

NATIONAL SCIENCE FOUNDATION
1800 G STREET, N.W.
WASHINGTON, D.C. 20550

FROM THE DIRECTOR
NATIONAL SCIENCE FOUNDATION

The National Science Foundation requests your company's participation in its 1992 Survey of Industrial Research and Development. This annual survey is the only source of detailed information on U.S. industry's research and development (R&D) performance.

Your company's participation is vital to the accuracy of the resulting information. Because R&D expenditures are concentrated in relatively few companies, a completed response is needed from each surveyed firm – there is no good substitute for the information that you can provide. Your company can be assured of complete confidentiality. Survey data will be released only in aggregate form so that responses of individual companies cannot be identified.

Survey results will be made available to government and industry officials, researchers, and other interested individuals. If you would like to receive a copy of the final publication or if you have suggestions for improvements, please contact Mr. John Gawalt or Mr. Raymond Wolfe, Division of Science Resources Studies, Room L-609, National Science Foundation, Washington, DC 20550, or by telephone at (202) 634-4673.

Sincerely,

A handwritten signature in black ink, appearing to read "Frederick M. Bernthal".

Frederick M. Bernthal
Acting Director

Enclosures



UNITED STATES DEPARTMENT OF COMMERCE

Bureau of the Census
Washington, DC 20233-0001

OFFICE OF THE DIRECTOR

FROM THE ACTING DIRECTOR
BUREAU OF THE CENSUS

The Bureau of the Census conducts the Survey of Industrial Research and Development under sponsorship of the National Science Foundation. Measures of research and development expenditures by industry are important in analyzing and forecasting long-term economic growth, investigating determinants of productivity, formulating tax policy recommendations, and comparing individual research performance against industry averages.

We are enclosing your report form and a file copy for the Survey of Industrial Research and Development, Report RD-1. To reduce response burden, we alternate between "long" and "short" versions of this report form. We are using the "short" version this year to obtain information for calendar year 1992.

We are also enclosing an instruction manual. Please read it carefully, since it provides guidelines for reporting. You may want to refer to it as you complete your report. We recognize that you may not maintain book records for particular items. In such cases, please use carefully prepared estimates.

The law (Title 13, United States Code) authorizes this report. Items 1A and 1B and Columns 2 and 4 of Item 4C are part of the basic statistical program of the Bureau of the Census for manufacturing companies, and reporting of these items is mandatory. Response to the remainder of the inquiries is voluntary; however, we need your cooperation to make the results of the survey comprehensive and accurate. By Section 9 of the same law (Title 13), your report to the Bureau of the Census is fully confidential. Only sworn Bureau of the Census employees will see the information you report, and they will use it only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

Please return the completed form within 60 days. If you have questions concerning this survey, please direct them to the Special Surveys Branch of our Industry Division on (301) 763-5598. If you need additional copies of the report or additional time, please call (812) 288-3331. We appreciate your past cooperation in this important survey and look forward to your continued participation.

Sincerely,

A handwritten signature in black ink, appearing to read "Harry A. Scarr".

Harry A. Scarr

Enclosures

PLEASE RETURN BY

OMB No. 3145-0027: Approval Expires 09/30/93

NOTICE — Your report to the Census Bureau is confidential by law (title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

RETURN TO
Bureau of the Census
1201 East Tenth Street
Jeffersonville, IN 47132-0001

Name of person who supplied 1991 data

FORM RD-1-8
(11-18-92)U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILED AGENT FOR
THE NATIONAL SCIENCE FOUNDATIONSURVEY OF INDUSTRIAL RESEARCH AND
DEVELOPMENT DURING 1992CENSUS
USE
ONLY
SURVEY CODE
4001

INDUSTRY CODE

WEIGHT

STATE

ADDRESS

SIC CODE

In correspondence pertaining to this report, refer
to this CENSUS FILE NUMBER (11 digits) ▶

Your participation is essential to make the results of this survey comprehensive, accurate, and timely. Response to items 1A and 1B and to item 4C, columns 2 and 4 for 1992 will satisfy the mandatory reporting requirements (title 13, U.S. Code).

PLEASE RETURN THIS COPY
(Please correct any error in name, address, and ZIP Code)

GENERAL INSTRUCTIONS

- Please complete this form and return within 60 days in the envelope provided. Retain the file copy for your records. **THIS REPORT SHOULD COVER YOUR ENTIRE COMPANY, INCLUDING ALL SUBSIDIARIES, UNLESS OTHERWISE DESIGNATED AND EXPLAINED IN REMARKS.**
- Enter 0 (zero) where appropriate rather than leaving a blank space.
- Reasonably accurate estimates are acceptable.
- Figures for 1991 are those reported by your company last year. **THE 1991 FIGURES SHOULD BE REVISED, IF NECESSARY, TO BE COMPARABLE WITH 1992 DATA.**
- Explain in "Remarks" on the reverse side any substantial increases or decreases in 1992 figures over 1991 (e.g., new government contracts, acquisitions, mergers, divestitures, etc.)

PLEASE READ ENCLOSED INSTRUCTION MANUAL BEFORE COMPLETING THIS FORM

SECTION I GENERAL COMPANY DATA

Item 1 — DOMESTIC SALES, RECEIPTS, AND EMPLOYMENT FOR COMPANY

	1991	1992
A. Domestic net sales and receipts of this company (Thousands of dollars)	101	102
B. Total domestic company employment in all activities during the pay period which includes the 12th of March 1991 and 1992	103	104

SECTION II RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES
(Exclude R&D financed by the company but performed by others. Report such R&D in section III.)

Item 2 — RESEARCH AND DEVELOPMENT EXPENDITURES

Are research and development expenditures for entire domestic company, including subsidiaries, reported on this form? YES NO — Please explain in remarks or on transmittal letter

Item 3 — NUMBER OF SCIENTISTS AND ENGINEERS INVOLVED IN RESEARCH AND DEVELOPMENT ACTIVITIES
Apportion on a full-time equivalent basis. (See instruction manual)

TOTAL	January 1992	January 1993
	113	114

Item 4 — COSTS INCURRED FOR RESEARCH AND DEVELOPMENT
PERFORMED WITHIN THE COMPANY BY MAJOR TYPE
AND SOURCE OF FUNDS

Include R&D depreciation and overhead; exclude R&D capital expenditures.
(See instruction manual)

		Thousands of dollars			
		1991	1992		
	TOTAL research and development (1)	Federal funds (2)	Company and other funds, except Federal (3)	TOTAL (Sum of columns 2 and 3) (4)	
A. Basic research	If "None," please mark (X) <input type="checkbox"/>	201	202	203	204
B. Applied research and development		211	212	213	214
1. Applied research		221	222	223	224
2. Development		231	232	233	234
C. TOTAL (Sum of A and B)		242	243	244	
D. 1991 TOTALS		253	253	254	
E. Company and other funds, except Federal, budgeted for the year 1993		263			

Item 5 — RESEARCH AND DEVELOPMENT BY FUNCTIONAL CATEGORY

Of the total reported in Item 4C, columns 2 and 4, report the following functional categories.

ENERGY RESEARCH AND DEVELOPMENT

Include the project cost or portion of project cost incurred for the purpose of increasing energy resources or capabilities. Include cost by type of energy.

		Thousands of dollars				
		1991	1992			1993
	Federal funds	Total funds	Federal funds	Total funds	Projected Federal funds	Projected total funds
A. Total nuclear	801	802	803	804	805	806
B. Total fossil fuels	816	816	817	818	818	820
C. Total geothermal, solar, conservation and utilization	853	854	855	856	857	858
D. All other energy	871	872	873	874	875	876
E. Total of A through D	877	878	879	880	881	882

POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT

Include the project cost or portion of the project cost incurred for the purpose of designing pollution abatement products or product characteristics or of designing pollution abatement features into processes.

		Thousands of dollars				
		1991	1992			1993
	Federal funds	Total funds	Federal funds	Total funds	Projected Federal funds	Projected total funds
F. Total	929	930	931	932	933	934

SECTION III RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS
(Not included in item 4)

		Thousands of dollars				
		1991	1992			1993
	Federal funds	Total funds	Federal funds	Total funds	Projected Federal funds	Projected total funds
G. Item 9 — TOTAL COMPANY FUNDS SPENT FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED BY FOREIGN SUBSIDIARIES OR BY OTHER ORGANIZATIONS OUTSIDE THE UNITED STATES	972		973			

CONTINUE ON REVERSE SIDE

Item 7 - STATUS OF THIS COMPANY ON DECEMBER 31, 1992

Yes — Complete Item 7B
 No — Skip to Item 8.

B. New owner information

Name 985	Date acquired 986
Address (Number and street) 987 City 988	
State 989	ZIP Code 990

REMARKS

991

Item 8 - CERTIFICATION This report is substantially accurate and has been prepared in accordance with instructions.

Name of person to contact regarding this report — Print or type

Mo Day Year

983	Area code	Number	Extension	Signature of authorized official
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INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1992

OUTLINE OF INSTRUCTIONS

Section	Page
General Instructions	1
Important Notes	2
Section I – General Company Data	2
Item 1 – Sales and Employment for Company	2
Section II – Research and Development Performed Within the Company in the United States	2
Definition of Research and Development	2
Item 2 – Research and Development Expenditures	2
Item 3 – Research and Development Scientists and Engineers	2
Item 4 – Costs Incurred for Research and Development Performed within the Company by Major Type and Source of Funds	3
Item 5 – Research and Development by Functional Category	4
Section III – Reporting of Research and Development Performed Outside the Company	4
Item 6 – Total Company Funds Spent for Research and Development Activities Performed by Foreign Subsidiaries Outside the United States	4
Item 7 – Status of This Company on December 31, 1992	4

GENERAL INSTRUCTIONS

Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development not available from any other source. By carefully completing this report, the accuracy of this information is ensured.

Estimates are Acceptable – If you cannot answer a question from your company records, please estimate the answer carefully. Direct any questions regarding this form to the Bureau of the Census, ATTN: Industry Division, Washington, DC 20233-0001 or call (301) 763-5598.

Additional Forms – Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 288-3331.

Companies Reporting in Survey for the First Time – Companies which did not report in the 1991 survey are asked to provide figures for both 1991 and 1992. If the company had no R&D expenditures, complete only Item 1. Enter "No R&D" in the "Remarks" section, sign, and return the form.

Figures for Earlier Years are Preposted on the Form – If your company reported for 1991, entries from that form have been copied on the present form. Please describe in the "Remarks" section (page 2 of the form) the reasons for any substantial

increase or decrease in the 1992 figures entered on this form when compared to corresponding 1991 figures. Examples of such reasons are new government contracts, acquisitions and divestitures, revised accounting method, etc. If you acquired or disposed of a unit performing an important amount of research and development during the 2-year period, please identify the unit in "Remarks," and give the total amount of research and development accounted for by such unit.

Revision of Earlier Year Figures – If your company reported for 1991, entries from that form are pre-printed on the current form. Please revise the 1991 figures to be comparable with 1992 data and explain in the "Remarks" section any significant revisions made.

Report for Your Entire Company – Research and development activities for your entire domestic company should be reported, including all subsidiaries, divisions, etc. Report sales and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 states or the District of Columbia.

Period Covered by the Report – Figures should be reported on a calendar years basis. Fiscal year data, however, are acceptable for all items except for employment, provided your fiscal year ends between September and March. Please report employment figures (items 1B and 3) for the specific time indicated for both of these items.

Geographic Area Covered – The data relate to business firms which operate one or more establishments in one or more of the 50 States or the District of Columbia.

Public reporting burden for this collection of information is estimated to average 5-1/2 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information including suggestions for reducing this burden to Herman G. Fleming, National Science Foundation, 1800 G Street, Washington, DC 20550; and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB No. 3145-0027), Washington, DC 20503.

IMPORTANT NOTES

- **Financial information** – Report all financial information in thousands of dollars.
- **Employment information** – Report all employment information in numbers of people.
- **Sales and employment (item 1)** – Report sales and employment information from all domestic subsidiaries, including those that do not perform research and development.
- **Costs incurred for R&D (item 4)** – Include R&D depreciation and overhead in your estimated costs. Exclude R&D capital expenditures.
- **Costs incurred for R&D (item 4)** – Costs incurred for R&D performed outside the 50 States or the District of Columbia or for R&D contracted out to non-company R&D organizations should not be reported in item 4. Report R&D performed outside of the United States in item 6.

► **Section II – Research and Development Performed within the Company in the United States**

Item 2 – Research and Development Expenditures

Definition of Research and Development – Research and development includes basic research and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purposes of this study, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.
2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.
3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

Activities to be excluded from R&D –

- Capital expenditures
- Routine product testing
- Research in social sciences or psychology
- Geological and geophysical exploration activities
- Technical services such as:
 - Quality and quantity control
 - Technical plant sanitation control
 - Trouble-shooting in connection with breakdowns in full-scale production
 - Advertising programs to promote or demonstrate new products or processes
 - Assistance in preparation of speeches and publications for persons not engaged in research and development

Item 3 – Research and Development

Scientists and Engineers – Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences, engineering, or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figures on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only research and development, report the number scientists and engineers on the rolls in January.

► **Section I – General Company Data**

Item 1 – Sales and Employment for Company

Item 1A – Net Sales – Report net sales and receipts for this company and its domestic subsidiaries. The reported figures should represent value f.o.b. plant after discounts and exclude freight charges and excise taxes.

Include:

- Sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries
- Transfers to foreign subsidiaries

Exclude:

- Domestic intra-company transfers
- Sales by foreign subsidiaries

Item 1B – Employment – Report the number of employees of the company in all activities in the 50 States and the District of Columbia during the pay periods which include March 12 of 1991 and 1992. This figure would be the same as item 1 of treasury form 941, if one form 941 was filed for the entire company.

Item 3 – Research and Development Scientists and Engineers – Continued

2. For companies whose activities are not solely devoted to research and development, report the proportion of total work time of scientists and engineers that is devoted to research and development. For example, if a company had 60 scientists and engineers in January 1993 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

Item 4 – Costs Incurred for Research and Development Performed within the Company by Major Type and Source of Funds –

Include:

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation and overhead
- Cost of computer software used in R&D activities
- Total charges for work done on contract, including profit
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expense
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude:

- R&D performed abroad (See Item 6), such as Canada and Puerto Rico
- Cost of R&D performed by non-company R&D organizations of any kind
- Capital expenditures
- Patent expense
- Income taxes and interest
- The portion of company-held R&D contracts that were subcontracted outside the reporting company
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering

Types of Research

Item 4A – Basic Research – Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives, (although they may be in the fields of present or potential interest to the reporting company).

Item 4B1 – Applied Research – Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 4B2 – Development – Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research findings or other general scientific knowledge into products or process.

Exclude routine technical services to customers or other items excluded from the definitions of total research and development in Item 2.

Type of Activity Included in Development:

- Design and operation of pilot plants and semiwork plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications standard practice instructions, or operating manuals

Type of Activity Excluded from Development

- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

Methods of Estimating Research and Development Expenditures by Type – (Basic, Applied, and Development) If your company does not keep records that meet or can be allocated to these specific categories, estimate by:

1. Isolating the **projects** that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's research and development frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.
2. Isolating the **organizational units** which have R&D activities that can be readily classified based on the function assigned to the unit. If R&D work is done in production units as well as in various laboratories, it is generally development type.
3. Distributing the **balance** on the basis of a review of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development given above.

Source of Funds – Federal and Company

Item 4 – Column 2 – Federal Funds

Include:

- Cost of work done on Federal R&D contracts or subcontracts
- R&D portions of procurement contracts or subcontracts

Exclude:

- Federal R&D contracts and R&D portions of procurement contracts that you subcontracted to other R&D organizations (including these would cause duplication in the statistical totals, which include data on work actually performed by each company).

Item 4 – Column 3 – Company and other funds, except Federal

Include:

- All company-sponsored research and development performed within the company
- Performed under contract from non-federal sources

Exclude:

- Company sponsored research performed outside of the company

Item 4E – Company and Other Funds, Except Federal, Budgeted for the Year 1993 – Report the estimated cost of company and other non-federally sponsored R&D that will be performed within the 50 states and the District of Columbia.

Item 5 – Research and Development by Functional Category

Item 5A to 5E – Energy Research and Development – Include all spending for research and development to increase energy resources or capabilities, including the development of energy equipment. Energy research and development can include costs of R&D projects (both product and process) on explorations, extractions, transportation, processing, storage, generation (including conversion), distribution, conservation, etc., of present, new, or improved forms of energy.

If R&D spending is for joint or multiple purposes, estimate and report the portion of cost incurred for the energy purpose. In the limited number of cases where the separation of joint (multiple) costs by type of energy cannot be esitmated, include the total cost of the R&D project when the primary purpose of the project is energy research and development. If the project is not primarily for energy research and development then exclude all of the project cost.

Conservation and utilization includes R&D activities undertaken to reduce consumption either at the point of energy use or in the transmission, transportation, storage, or conversion of energy. Examples of such are research and development undertaken primarily to reduce fuel consumption in manufacturing, to improve the efficiency of transportation of energy products, or to produce an end product which is more efficient in energy consumption.

All other energy includes areas such as wind, waste, hydroelectric, etc. Also include in this category the development of energy equipment which cannot adequately be classified in items 5A to 5C.

Item 5F – Pollution Abatement Research and Development – Includes R&D spending for the purpose of reducing or eliminating the emission of pollutants. "Pollution" refers to the emission of pollutants to the outside of a firm's property or activities; "abatement" includes prevention, treatment, or recycling.

Exclude costs:

- To contribute to environmental aesthetics
- To increase equipment durability in corrosive environments
- To conserve energy (include as energy R&D in item 5C)
- To conserve natural resource
- To increase employee comfort, safety, and health.

If the only purpose of the R&D spending is pollution abatement, include the total expenditures on the project. If pollution abatement is only one of several purposes, report only the R&D costs associated with pollution abatement. When the separation of joint costs is not feasible, include the total R&D costs for a project if the purpose is primarily (more than 50 percent) for pollution abatement.

If the project is not primarily for pollution abatement purposes, exclude all of the project costs. Also exclude project costs if expected pollution abatement benefits are obtained at no extra cost.

► **Section III – Research and Development Performed Outside the Company – (R&D not included in item 4).**

Item 6 – Total Company Funds Spent for Research and Development Activities Performed by Foreign Subsidiaries Outside the United States.

Report the amount of research and development financed by the U.S. parent or its foreign subsidiaries and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States. Include R&D funds spent in Canada and Puerto Rico. This item excludes R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations.

NOTE – Foreign subsidiaries are those outside the 50 States or the District of Columbia.

Item 7 – Status of This Company on December 31, 1992

In the "Remarks" section, specify change or correction, e.g., "wholly-owned subsidiary of ABC Company," "merger with XYZ Company," "acquired by 123 Corporation." Provide date of organizational change.

NOTICE — Your report to the Census Bureau is **confidential** by law (title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are **immune from legal process**.

The instructions and definitions on this form are not complete. Please read the enclosed instruction sheet before completing this form.

RETURN TO

BUREAU OF THE CENSUS
1201 East 10th Street
Jeffersonville, IN 47132-0001

Data supplied in item 1 and in item 3A.3, columns (4) and (6), for 1992 on this form will satisfy the mandatory reporting requirements (Title 13, U.S. Code).

PLEASE RETURN THIS COPY

► **Item 1 – SALES AND EMPLOYMENT FOR COMPANY (Domestic)**

A. Include sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries. **Exclude** domestic intra-company transfers, and sales by foreign subsidiaries.

B. Total domestic company employment in all activities during the pay period which includes the 12th of March 1991 and 1992. (Item 1 of Treasury Form 941, if one Form 941 was filed for the entire company.)

Domestic net sales and receipts of this company

1991 1992

Bil.	Mil.	Thou.	Dol.	Bil.	Mil.	Thou.	Dol.
101			000	102			000
\$				\$			

Domestic employment

1991 1992

Number	Number
111	112

RESEARCH AND DEVELOPMENT — R&D

Includes basic and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purposes of this study, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.

2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.

3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

See instructions for more detail.

► **Item 2 – CHECK FOR RESEARCH AND DEVELOPMENT**

Mark (X) the appropriate box.

- 201 Company had R&D in 1992 – *Complete and return this form.*
- 202 Company had no R&D in 1992, but has in the past and may in the future – *Complete form, enter zeros where applicable, and return this form.*
- 203 Company does not conduct R&D – *Go to item 7, sign and return this form.*

Remarks

801

INSTRUCTIONS AND DEFINITIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1992 FORM RD-1A

GENERAL INSTRUCTIONS

Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development not available from any other source. By carefully completing this report, the accuracy of this information is ensured.

Estimates are acceptable – If you cannot answer a question from your company records, please estimate the answer carefully.

Report all value figures in thousands of dollars.

Example: 1,123,678,599 dollars.

	Bil.	Mil.	Thou.	Dol.
Report	\$ 1	123	679	599

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124 million dollars.

	Bil.	Mil.	Thou.	Dol.
Report	\$ 1	124	000	000

Enter "0" where appropriate rather than leaving blank spaces.

If you have questions regarding reporting problems on this form, please write to the Bureau of the Census, Industry Division Washington, DC 20233 or call (301) 763-5598.

Additional forms – Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 288-3331.

Report for your entire company – Research and development activities for your entire domestic company should be reported, including all divisions, etc. Report sales and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 States or the District of Columbia.

Period covered by the report – Figures should be reported on a calendar year basis. Fiscal year data, however, are acceptable for all items except for employment, provided your fiscal year ends between September and March. Please report employment figures (Item 1B and 3) for the specific time indicated for both of these items.

Geographic area covered – The data relate to business firms which operate one or more establishments in one or more of the 50 States or the District of Columbia.

The data are intended to relate to business firms in the fields of manufacturing, minerals, and other economic areas.

Please complete and return this form in the envelope provided within 60 days. Please make a copy for your records.

This report should cover your entire domestic company, including all subsidiaries and affiliates, unless otherwise designated.

Public reporting burden for this collection of information is estimated to average 1 hour per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information including suggestions for reducing this burden to Herman G. Fleming, National Science Foundation, 1800 G. Street, Washington, DC 20550; and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB No. 3145-0027), Washington, DC 20503.

DEFINITIONS

Research and development – Research and development includes basic research and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purpose of this study, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.
2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.
3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

Activities to be excluded from R&D –

- Capital expenditures
- Routine product testing
- Research in social sciences or psychology
- Geological and geophysical exploration activities
- Technical services such as:
 - Quality and quantity control
 - Technical plant sanitation control
 - Trouble-shooting in connection with breakdowns in full-scale production
 - Advertising programs to promote or demonstrate new products or processes
 - Assistance in preparation of speeches and publications for persons not engaged in research and development

Research and development scientists and engineers

– Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences, engineering, or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

This figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only research and development, report the number of scientists and engineers on the rolls in January.
2. For companies whose activities are not solely devoted to research and development, report the proportion of total work time of scientists and engineers that is devoted to research and development. For example, if a company had 60 scientists and engineers in January 1993 and one-fourth of their time was charged to R&D projects, the figure for the number of scientists and engineers for this company would be 15.

SPECIFIC INSTRUCTIONS**Item 1 – SALES AND EMPLOYMENT FOR COMPANY (Domestic)****Item 1a – DOMESTIC NET SALES AND RECEIPTS –**

Report net sales and receipts for this company and its domestic subsidiaries. The reported figures should represent value f.o.b. plant after discounts and exclude freight charges and excise taxes.

Include:

- Sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries
- Transfers to foreign subsidiaries

Exclude:

- Domestic intra-company transfers
- Sales by foreign subsidiaries

Item 1B – DOMESTIC EMPLOYMENT – Report the number of employees of the company in all activities in the 50 States and the District of Columbia during the pay periods which include March 12 of 1991 and 1992. This figure would be the same as Item 1 of Treasury Form 941, if one Form 941 was filed for the entire company.

Item 2 – CHECK FOR RESEARCH AND DEVELOPMENT –

Check the appropriate box that best describes the R&D activities of your company.

Item 3 – REPORT COSTS INCURRED FOR RESEARCH AND DEVELOPMENT BY MAJOR TYPE AND SOURCE OF FUNDS –**Include:**

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation and overhead
- Cost of computer software used in R&D activities
- Total charges for work done on contract, including profit
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use

- Insurance expense
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude:

- R&D performed abroad (see ITEM 3.C.), such as in Canada and Puerto Rico
- Cost of R&D performed by non-company R&D organizations of any kind
- Capital expenditures
- Patent expenses
- Income taxes and interest
- The portion of company-held R&D contracts that were subcontracted outside the reporting company
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering

Item 3.A – REPORT COST INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY**Types of Research**

Item 3.A.1 – BASIC RESEARCH – Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives (although they may be in the fields of present or potential interest to the reporting company).

Item 3.A.2.a – APPLIED RESEARCH – Includes the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 3.A.2.b – DEVELOPMENT – Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research findings or other general scientific knowledge into products or process.

Exclude routine technical services to customers or other items excluded from the definition of total research and development.

Types of activities included in development

- Design and operation of pilot plants and semipilot plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications standard practice instructions, or operating manuals

Types of activities excluded from development

- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

Methods of estimating research and development expenditures by type (basic, applied, and development) – If your company does not keep records that meet or can be allocated to these specific categories, estimate by:

1. Isolating the projects that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's research and development frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.
2. Isolating the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. If R&D work is done in production units as well as in various laboratories, it is generally development type.
3. Distributing the balance on the basis of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development given above.

Item 3.A.2.c – TOTAL APPLIED RESEARCH AND DEVELOPMENT – Add line 3.A.2.a and line 3.A.2.b.

Item 3.A.3 – TOTAL WITHIN COMPANY (BASIC RESEARCH AND APPLIED RESEARCH AND DEVELOPMENT) – Add line 3.A.1 and line 3.A.2.c.

Item 3.B – TOTAL COMPANY FUNDS FOR RESEARCH AND DEVELOPMENT ACTIVITIES FINANCED BY THE COMPANY BUT PERFORMED BY OTHERS OUTSIDE THE COMPANY WITHIN THE UNITED STATES – Includes payments for research and development activities in the form of contracts, grants, fellowships, etc., made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions, etc.

Exclude:

- Subcontracting of R&D contracts received from the Federal Government or other companies

Item 3.C – TOTAL COMPANY FUNDS FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED BY FOREIGN SUBSIDIARIES OR BY OTHER ORGANIZATIONS OUTSIDE THE UNITED STATES – Report the amount of research and development financed by the U.S. parent or its foreign subsidiaries and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States.

Include:

- R&D funds spent in Canada and Puerto Rico

Exclude:

- R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations

NOTE – Foreign subsidiaries are those outside the 50 States or the District of Columbia.

Item 3.D – TOTAL – Company and other funds, except Federal. Add Items 3.A.3, 3.B, and 3.C.

SOURCE OF FUNDS

Item 3 – FEDERAL FUNDS (Columns 1 and 4)

Include:

- Cost or work done on Federal R&D contracts or subcontracts
- R&D portions of procurement contracts or subcontracts

Exclude:

Federal R&D contracts and R&D portions of procurement contracts that you subcontracted to other R&D organizations (including these would cause duplication in the statistical totals, which include data on work actually performed by each company).

Item 3 – COMPANY AND OTHER FUNDS (columns 2 and 5)

Include:

- All company-sponsored research and development performed within the company
- R&D performed under contract from non-federal sources

Exclude:

- Company sponsored research performed outside of the company

Item 4 – COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR R&D PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1993 – Report the estimated cost of company and other non-federally sponsored R&D that will be performed within the 50 States and the District of Columbia. This item is comparable to the 1992 figure reported in Item 3.A.3, column 5.

Item 5 – NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS – Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only research and development, report the number of scientists and engineers on the rolls in January.
2. For companies whose activities are not solely devoted to research and development, report the proportion of total work time of scientists and engineers that is devoted to research and development. For example, if a company had the full-time equivalent of 60 scientists and engineers in January 1993 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

Item 6A – OPERATIONAL STATUS – Indicate if this company was owned or controlled by another company on December 31, 1992.

Item 6B – Report the date the company was acquired and the new owner's name and address.

Item 7 – CERTIFICATION – Report the name and telephone number of the person to contact regarding this report.

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